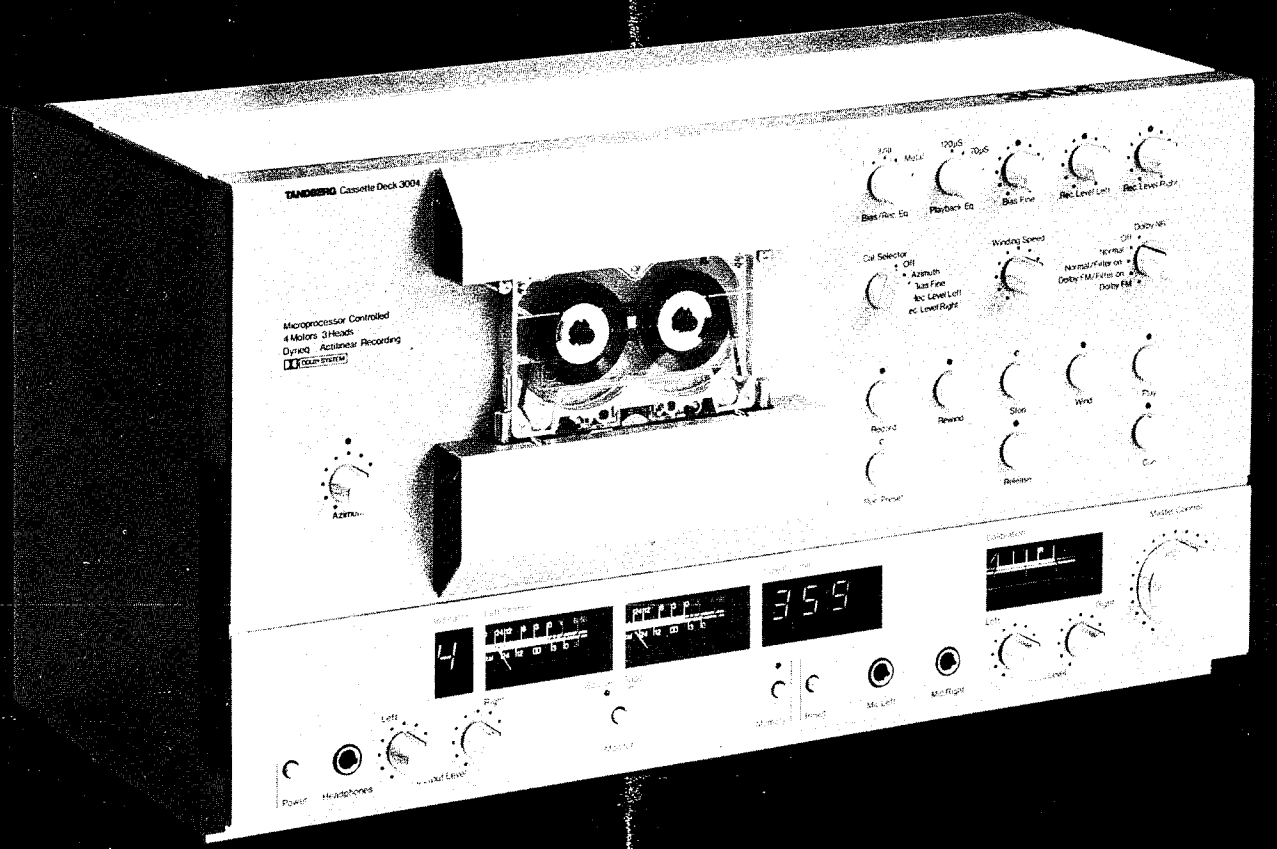
TANDBERG®
TCD 3004
Service Manual



TANDBERG® — The European Alternative

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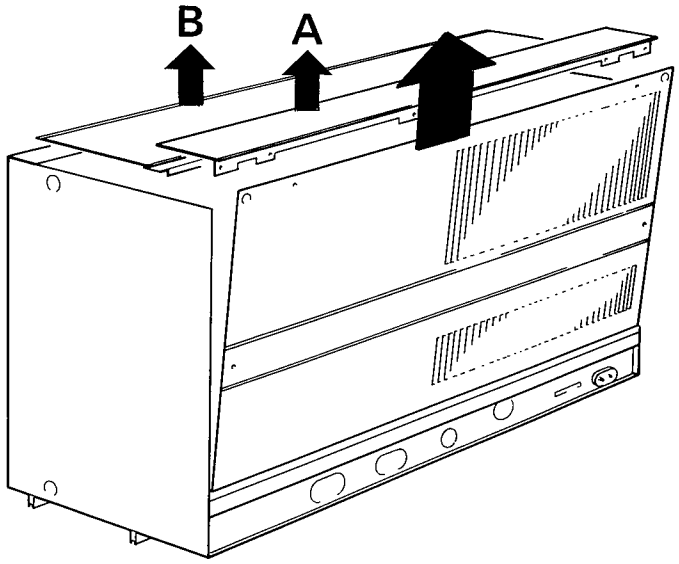
Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation.

Removing the front panel

Remove the five screws on the rear panel and lift the panel in the direction of the arrow, see figure.

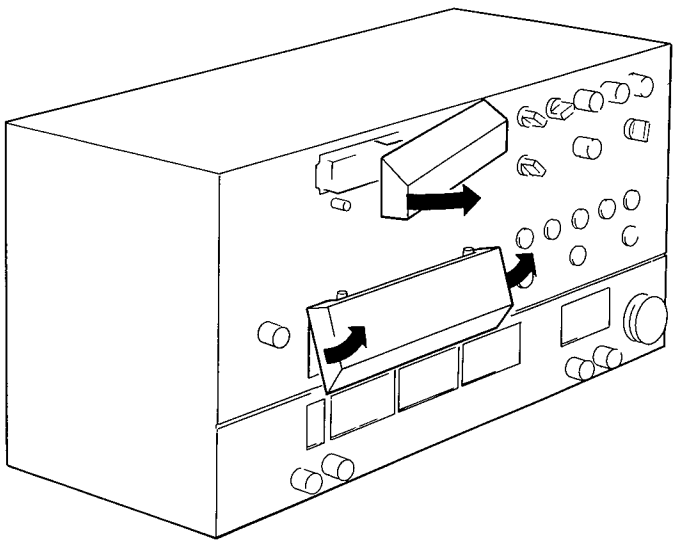
Then remove the screws on the panels A and B, see figure.



Pull off the head covers, see figure.

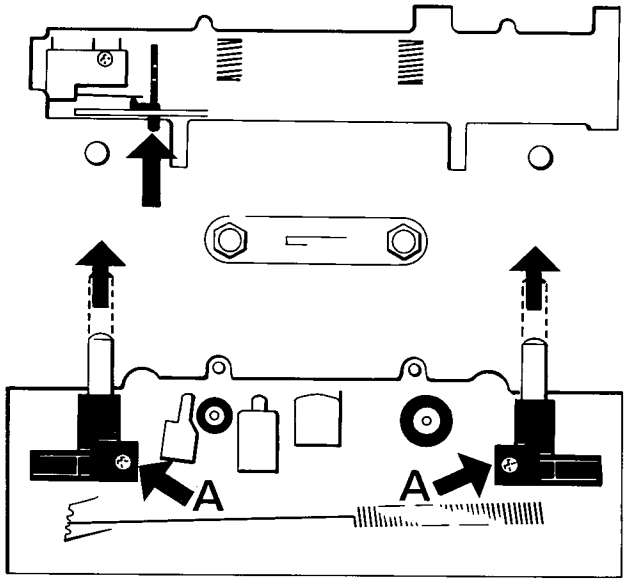
When you pull off the rotary knobs*, the Playback Eq. knob must not be mixed with the other knobs, because it is different on its inside.

* NOTE! Do not pull off the function knobs as Record, Rec. Preset, Rewind, Stop, etc. or the other push buttons.



Loosen* the screws A in the figure with maximum two turns.

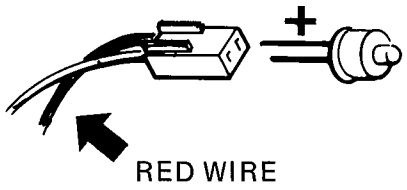
* NOTE! If you unscrew the two screws A, the nuts behind the screws will fall down.



Push or pull the cassette guides out from the black plastic moldings, see figure.

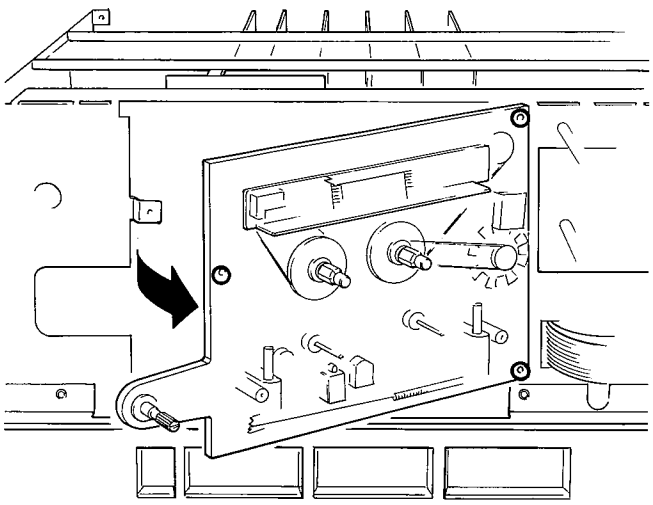
Press in the record-protection switch, see figure and remove the front panel by pulling the upper edge away from the deck.

When replacing the panel, the long leg on the LED must be connected to the red wire on the socket, see figure.



Cassette drive mechanism

Remove the three mounting screws and lift the mechanism out, see figure.

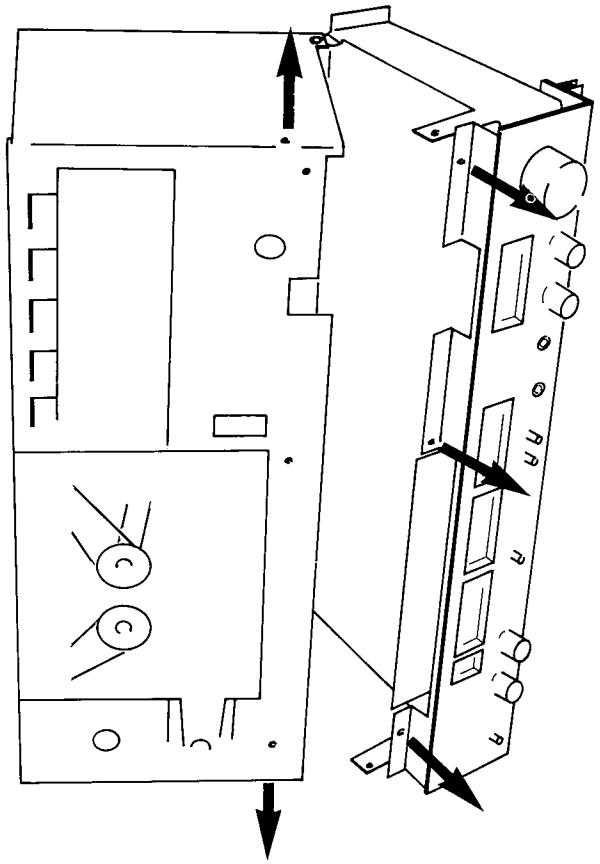


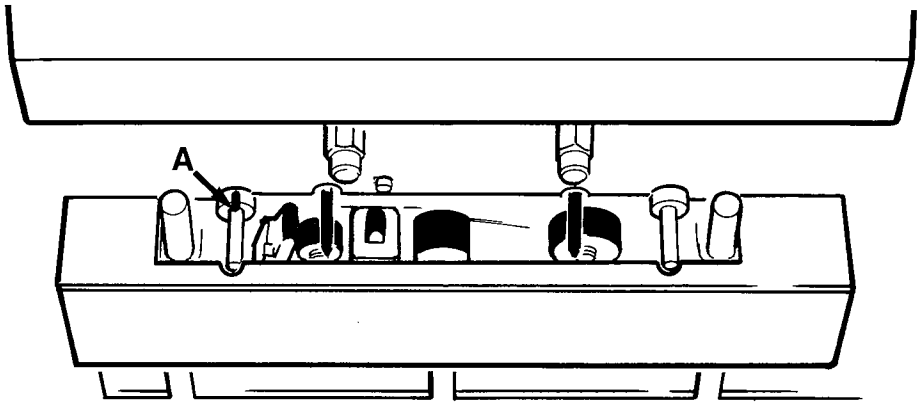
Service position

Remove the front panel.

Remove the side panels

Remove the five screws as shown in the figure.





Clean the places marked with colour.

Cleaning the tape path

- Press the Release button and remove the cassette.
- Press in the cassette sensor (A) and the Stop button. This raises the tape path and makes it more accesible for cleaning.
- Clean those places marked in colour in the figure. The pinch rollers must be well dried after cleaning.
- Take care that the cleaning fluid does not run along the capstans into the bearings.

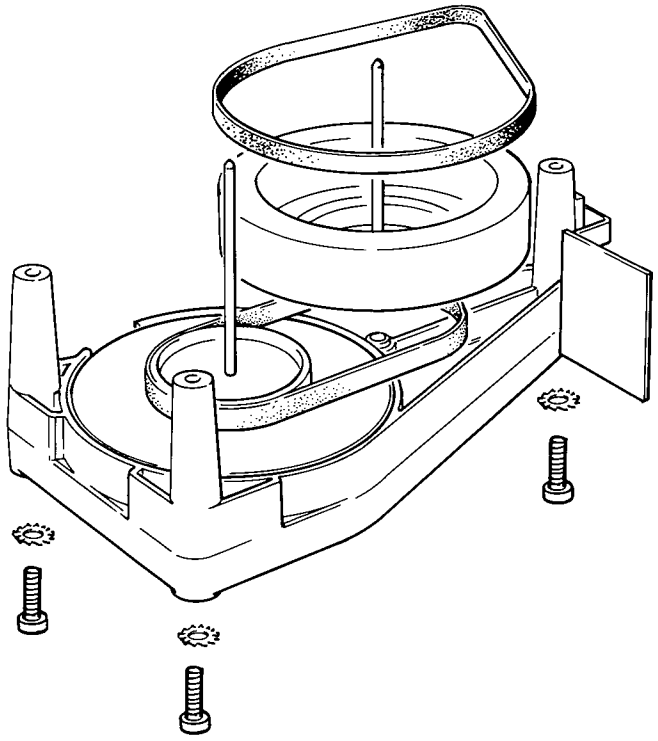
De-magnetizing

An audible increase in background noise from the tape can be a sign that the heads and other parts of the tape path need to be de-magnetized. This can be done with a de-magnetizing rod and the procedure is as follows:

Switch off the cassette deck. Remove the lower head cover. Switch on the de-magnetizer and move it slowly past the metal parts which are normally in contact with the tape. Make sure that the rod does not touch the metal parts. Do not switch off the rod before it is at least *1 meter* from the deck.

Replacing the drive belts

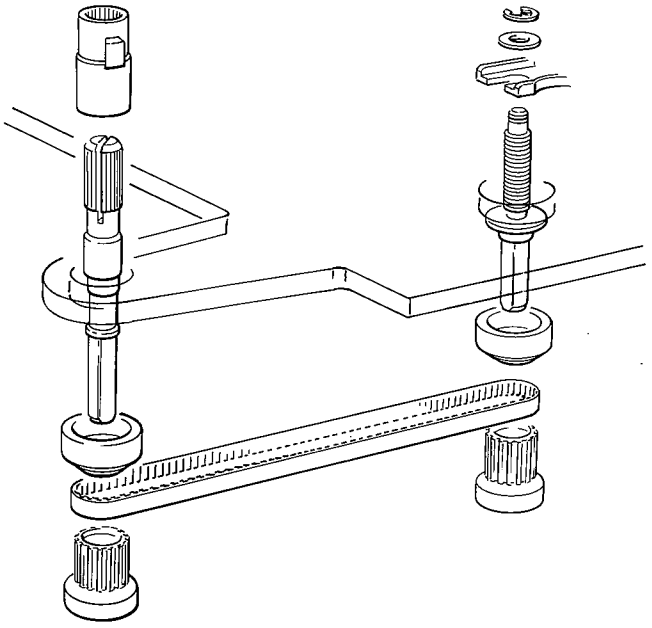
Remove the three screws (see figure) to loosen the mounting plate. Replace the drive belts and fasten the mounting plate. Check that the capstans have a small play. If not, adjust the bottom bearings and seal the bearings with some laquer.



Replacing the drive belts

Replacing the azimuth wire

From approximately serial No. 00700, the wire is replaced with a belt. When ordering the wire from our Spares Department, you will receive the new belt with neccessary parts. When installing the new belt, see figure.



The new azimuth belt

Dismantling the drive mechanism

When dismantling the mechanism start with parts marked in colour in figure 1, continue to figure 2, and so on.

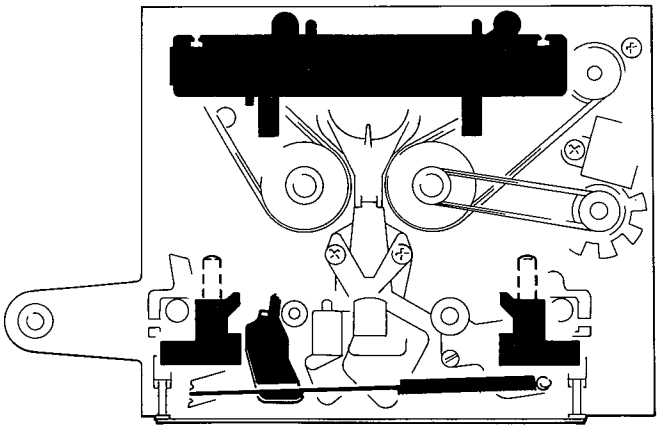


Figure 1

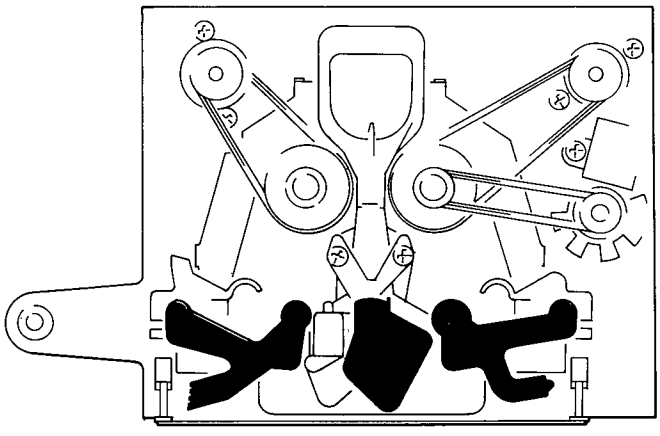


Figure 2

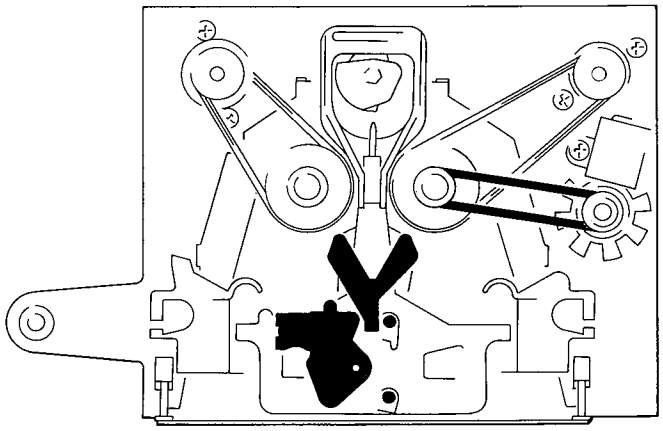


Figure 3

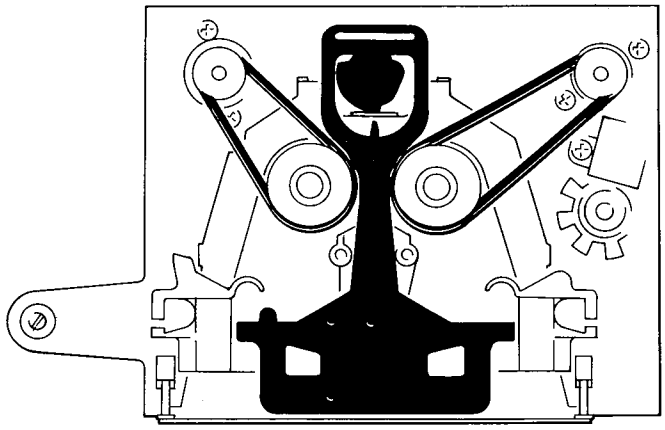


Figure 4

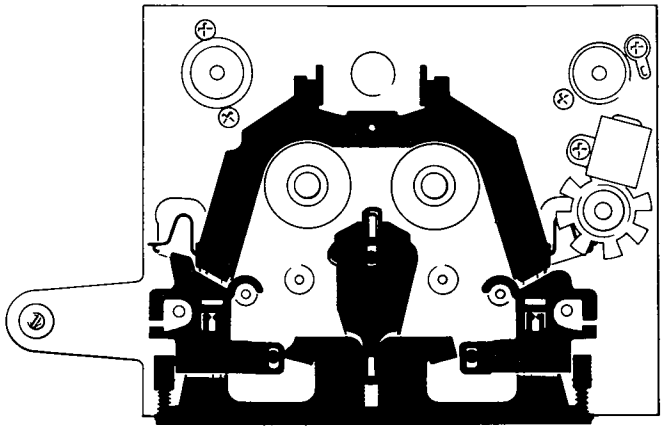


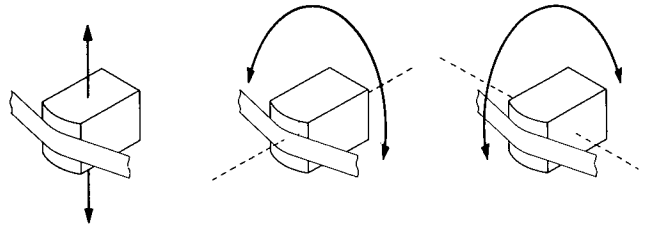
Figure 5

Tape path adjustments

NOTE! If you use a tape path gauge, move part B on the gauge slowly and carefully when it is near the heads.

The tape path adjustments must be carried out in the order described since they affect each other.

Before adjusting, fold out page 9.

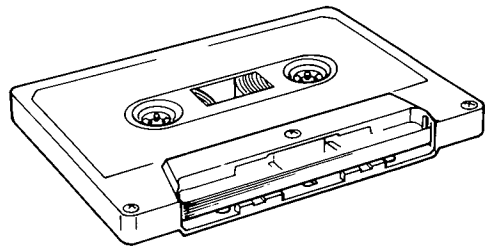


Height *Azimuth* *Parallelity*

Erase head

The erase head has only a height adjustment. Adjust the height so that the tape guides do not rub against the tape when the head bridge is in Play position.

If you use a Tandberg tape gauge, part B of the gauge must fit into the tape guides on the erase head, see figure.



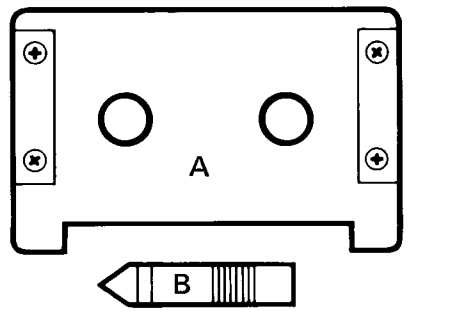
Open cassette

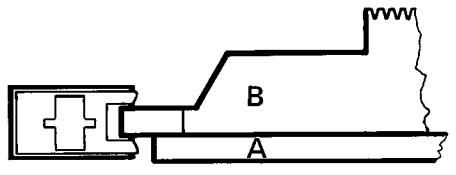
Playback head

Use an open cassette*. Adjust the height of the playback head so that the tape guides do not rub on the tape when the head bridge is in the Play position. Adjust the height by means of the screws shown in the figure. Adjust the height adjustment screws by equal amounts so that the parallelism does not change.

Insert a Tandberg test tape No. 23 or a standard azimuth cassette. Adjust the azimuth screw on the playback head to obtain max. output measured on the Play sockets.

* If you use a Tandberg tape path gauge, part B of the gauge will fit into the tape guides on the playback head when the head is at the correct height. The pointed end of B must be parallel with the head face.





Tape path gauge

Record head

Adjusting the parallelism

Insert an open cassette and make sure that the tape lies parallel with the head face. Adjust the height by means of the screws shown in the figure.

Adjusting the height

Insert a new cassette. Set the deck to Record. Record 1000 Hz from an audio generator at normal recording level. Set the Monitor switch to Tape and adjust the height of the record head by means of the screws shown in the figure to obtain max. output on the Play sockets. When you obtain max. output on the sockets, the tracks across the heads will be at the same height.

Adjust the height adjustment screws by equal amounts so that the parallelism does not change.

Adjusting the eccentricity screw

NOTE! Seal the eccentricity screw after the adjustment.

After one or both pinch rollers have been changed you must check that the eccentricity screw is correctly adjusted.

Press down the cassette sensor and set the deck to Play.

Press the head bridge assembly away from the capstans. Then check that both pinch rollers meet the capstans at the same time. If necessary, adjust the eccentricity screw shown in the figure.

Electrical adjustment

Equipment required:

- 2 millivoltmeters
- Audio signal generator
- Frequency counter
- Distortion meter
- Wow and flutter meter
- Tandberg test cassettes:
  No. 21 (speed check 1000 Hz)
  No. 22 (wow and flutter check 3150 Hz)
  No. 23 (azimuth adj. playback head 6300 Hz)
  No. 24 (playback level adj. 1000 Hz)
  No. 29 (tape path check)
- Tandberg tape path gauge
- Measuring cassettes:
  Maxell UD XL I (Group I)
  Maxell UD XL II (Group II)
  Maxell Metal MX or TDK Metal MA (MA-R)

General

Before adjusting the tape path must be cleaned and demagnetized, see page 4. The adjustments require that the tape path is correctly adjusted.

Remove the back panel and the base panel.

Before adjusting, set the knobs to:
- Bias/Rec. Eq. to position I.
- Playback Eq. to position 120 uS.
- Cal. Selector to Off.
- Dolby NR. to Off.
- Input and Output Level controls to maximum.

Before adjusting, fold out page 9.

Oscillator

The bias oscillator frequency is between 80 and 90 kHz.

The test and azimuth oscillator frequency is approx. 400 Hz and 12 kHz.

The voltage measured on the erase head should be with the Bias/Rec. Eq. switch in:
position I: approx. 5.2 V
position II/III: approx. 8.4 V
position Metal: approx. 8.4 V

Bias traps

Set the deck to record mode.

Encoder

Measure with a millivoltmeter on C107 (Left) and C207 (Right) on the A1, Dolby encoder board. Adjust with L101 (Left) and L201 (Right) to minimum reading on the millivoltmeter.

Decoder

Measure with a millivoltmeter on C502 (Left) and C602 (Right) on the A3, Dolby decoder board. Adjust L501 (left) and L601 (Right) to minimum reading on the millivoltmeter.

Sensitivity adjustment

- Set the Monitor switch to Source.
- Apply 80 mV, 1000 Hz to the Record sockets.
- Adjust the SENS ADJ. (A15) R2124/R2224 to 725 mV measured on the Dolby Encoder (A1) test points, see figure.
- Move the measure probe to Dolby Decoder (A3) test points and adjust with SOURCE ADJ. (A3) R502/R602 to obtain 725 mV.
- Insert a cassette (to operate the cassette sensor).
- Set the deck to Stop mode.
- Adjust the REC. METER (A15) R2301/R2401 to obtain 0 dB on the program meters (scale I – II).

DYNEQ adjustment

The DYNEQ adjustment must be adjusted with the Bias/Rec. Eq. in position I.

When the program meters are correct, reduce the level on the audio generator (1000 Hz) with 10 dB. Set the generator to 15 kHz. Adjust with the DYNEQ ADJ. (A2) R346/R446 to – 1 dB (scale I – II) deflection on the program meters.

Playback adjustment

- Insert Tandberg test cassette No. 23 (azimuth adj. playback head 6300 Hz) or a standard azimuth cassette.
- Adjust the playback azimuth screw to maximum output or best compromise on the Play sockets.
- Insert Tandberg test cassette* No. 24 (Playback level adj. 1000 Hz) and adjust with PLAYBACK LEVEL (A3) R503/R603 to 725 mV measured on the Dolby Decoder test points TP3 and TP4.
- Adjust the program meters to 0 dB with PLAYB. METER (A15) R2303/R2403.

The PLAYB. EQ. (A4), R713 and R813 are adjusted from the factory and should not be adjusted.

* If you use a Dolby level cassette, adjust to 580 mV measured on the Dolby Decoder test points TP3 and TP4. Then adjust the program meters to the double-D-symbol.

Adjustments for metal tape

- Set the knobs Bias Fine, Rec. Level Left, and Rec. Level Right to mid-position.
- Set the Bias/Rec. Eq. to Metal and the Playback Eq. to 70 uS.
- Use Maxell Metal MX or an equivalent metal tape.
- Use a – 20 dB recording level.

  NOTE! Remember the azimuth adjustment of the record head.
- Check the frequency response and, if necessary, adjust the BIAS METAL (A5) R909/R1009 to obtain the correct response, ± 3 dB from 19 to 21000 Hz.

Record Eq.

- This adjustment affect the record eq. for all groups of tapes. Adjust the RECORD EQ (A2) R312/R412 to + 1 dB at 18 kHz when using metal tape.
- Use the same level, – 20 dB.
- If necessary, adjust the RECORD EQ (carefully) so that the frequency response is correct for all groupes of tapes.

Adjusting the record current (Source/Tape) for metal tape

- Use – 10 dB level, 1000 Hz.
- Adjust the record current with REC. LEVEL METAL (A2) R326/R426 to obtain the same output level for both positions on the Monitor switch.
- Check the frequency response with and without the Dolby system. Use 1000 Hz, without the Dolby system as a referance.

Adjustment for group II tape

- Set the Bias/Rec. Eq. to II/III and the Playback Eq. to 70 uS.
- Use Maxell UD XL II or an equivalent group II tape.
- Use – 20 dB recording level.

NOTE! Remember the azimuth adjustment on the record head. Check the frequency response (see RECORD EQ. adjustment, and if necessary, adjust the BIAS II/III (A5) R907/R1007 to obtain the correct response, ± 3 dB from 19 to 20000 Hz.

Adjusting the record current (Source/Tape) for group II tape

- Use – 10 dB level, 1000 Hz.
- Adjust the record current with REC. LEVEL II/III (A2) R323/R423 to obtain the same output level for both positions on the Monitor switch.

Adjustment for group III tape

Use the calibration system (Cal. Selector) to adjust for group III tape.

Adjustment for group I tape

- Set the knobs Bias Fine, Rec. Level Left and Rec. Level Right to mid-position.
- Set the Bias/Rec. Eq to I and Playback Eq. to 120 uS.
- Use Maxell UD XL I or an equivalent group I tape.
- Use a – 20 dB recording level.

NOTE! Remember the azimuth adjustment on the record head. Check the frequency response (see RECORD EQ. adjustment) and if necessary, adjust the BIAS I (A5) R905/R1005 to obtain the correct response, ± 3 dB from 19 to 19,000 Hz.

Adjusting the record current (Source/Tape) for group I tape

- Use – 10 dB level, 1000 Hz.
- Adjust the record current with REC. LEVEL I (A2) R320/R420 to obtain the same output level for both positions on the Monitor switch.

Adjusting the calibration system

- Set the TCD 3004 to Stop.
- Set the Monitor switch to Source.
- Set the Cal. Selector to Rec. Level R.
- Adjust the 400 Hz OSC. ADJ. (A5) R958 to 580 mV measured on the right Decoder (A3) test point TP4.
- Then adjust with REC. LEVEL CAL. (A5) R993 to R (ref.) deflection on the Calibration meter.
- Set the Cal. Selector to Rec. Level L.
- Check that the left Decoder (A3) test point TP3 has 580 mV and that the deflection on the Calibration meter is on R (ref.).
- Set the Cal. Selector to Bias Fine.
- Measure on the right Decoder (A3) test point TP3. This level is approximately 25 dB below 580 mV. Adjust with the 12 kHz OSC. ADJ. (A5) R967 to the Calibration meter shows the same level for both 400 Hz and 12 kHz.
- Then adjust the BIAS FINE CAL. (A5) R991 to middle deflection on the calibration meter.
- Set the Cal. Selector to Azimuth.
- Adjust with the AZIMUTH CAL. (A5) R989 to R deflection on the Calibration meter.
- Check the Calibration system in all functions and with all groups of tapes.

Distortion

Record 1000 Hz at 0 dB deflection on the meters. The max. distortion for record/playback are 3% with metal tape and 1% with conventional tapes.

Erase test

Record 1000 Hz at 0 dB deflection on the meters. Record again to erase the 1000 Hz signal and play back to ensure that the signal cannot be heard.

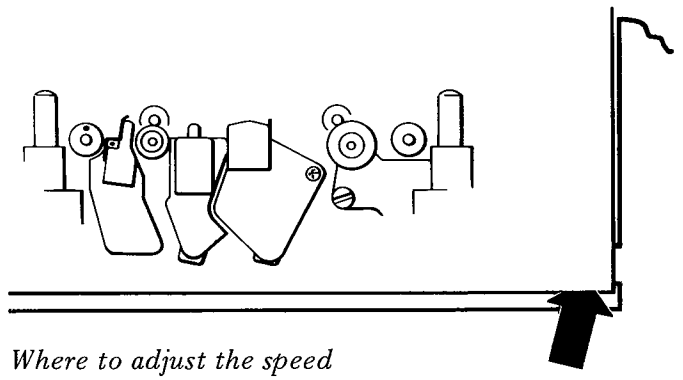
Measure with a narrow band filter, frequency < 10 Hz: Metal tape > 80 dB.

NOTE! If filter bandwidth is too wide, it is not possible to measure better than approximately 75 dB.

Speed check

Play back Tandberg test cassette No. 21 (speed check 1000 Hz), and measure with a frequency counter on the Play sockets: ± 0.5% (995 to 1005 Hz).

If necessary, adjust SPEED ADJ. to correct speed. Remove the front panel, see page 2. Then adjust the SPEED ADJ. on the motor control board with an insulated screwdriver, see figure.



Where to adjust the speed

Wow and flutter check

Playback

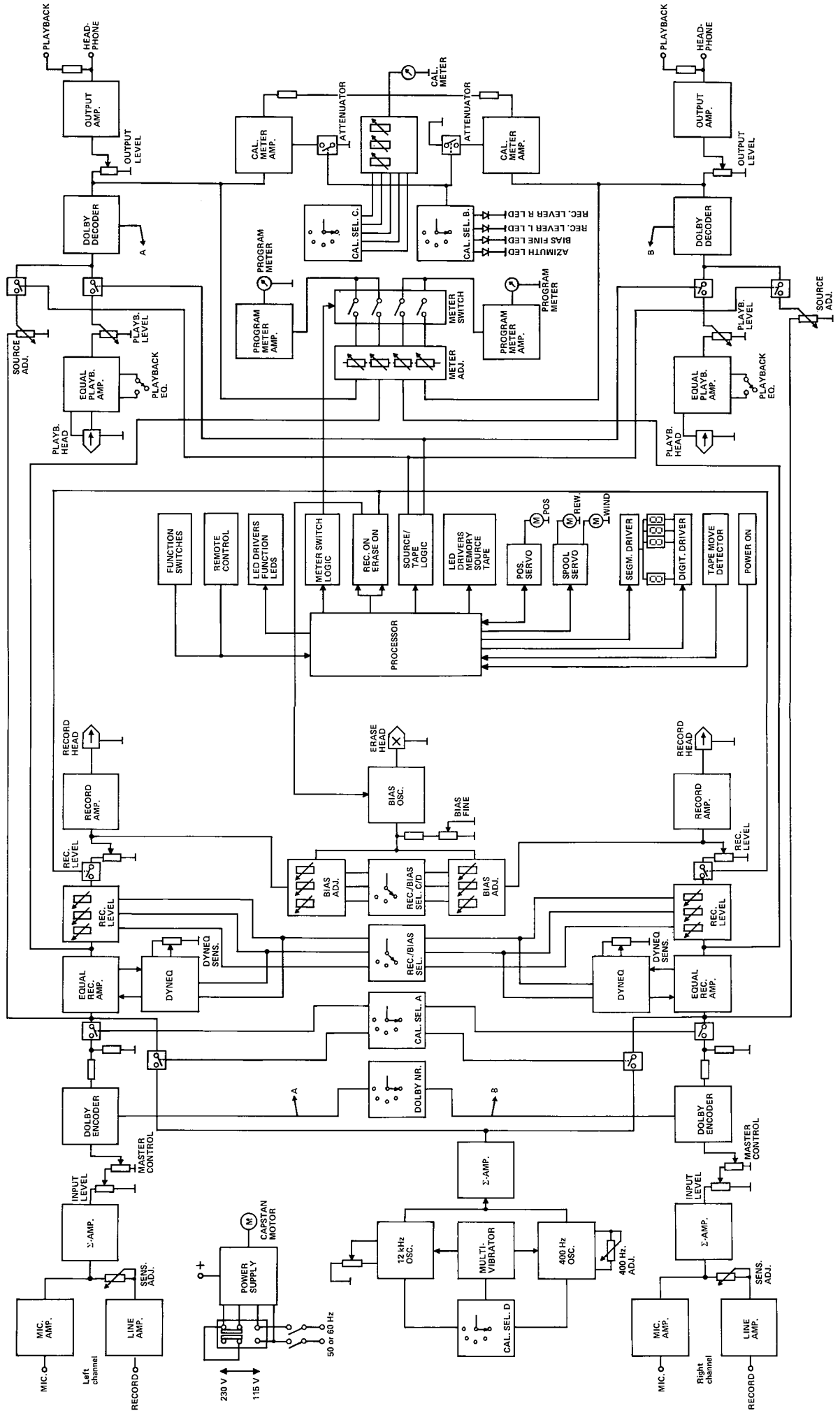
Play back Tandberg test cassette No. 22 (3150 Hz) and measure with a wow and flutter meter on the Play sockets:
Playback (RMS): $< 0.06\%$

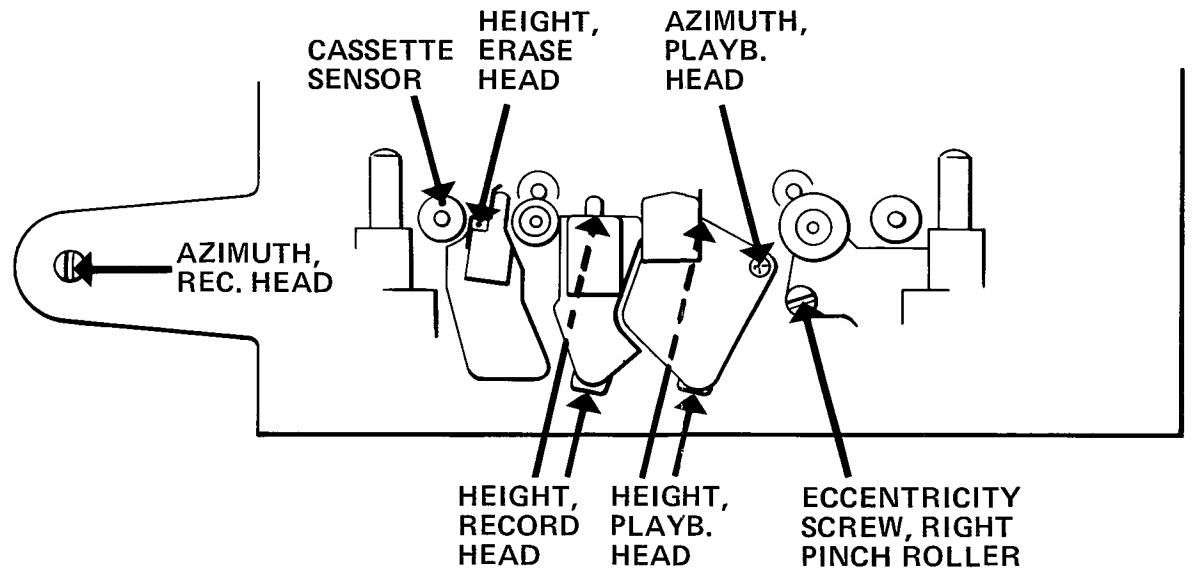
Record/playback

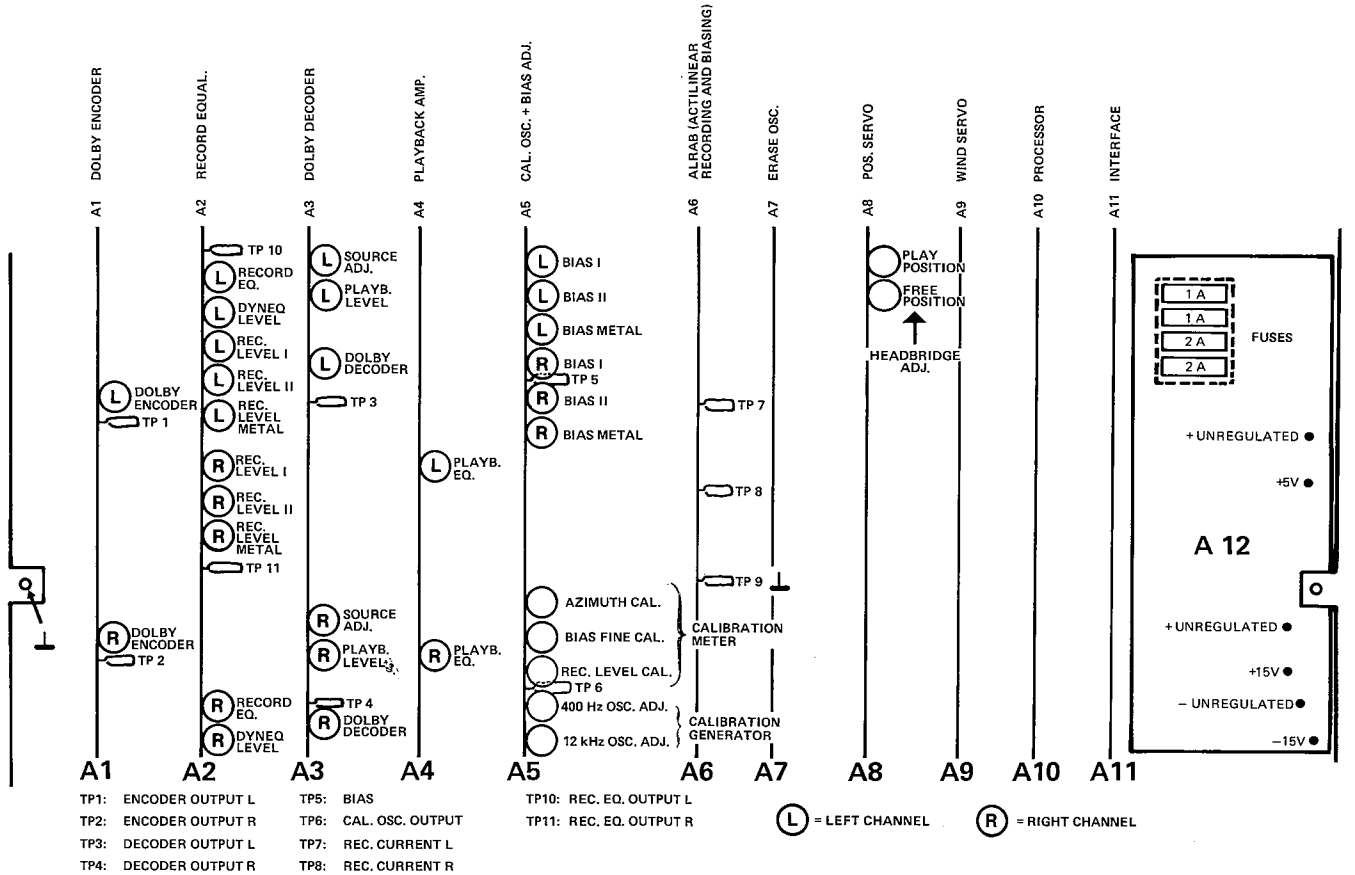
Use a Maxell C-60 UD cassette. Connect the wow and flutter meter to the TCD 3004.

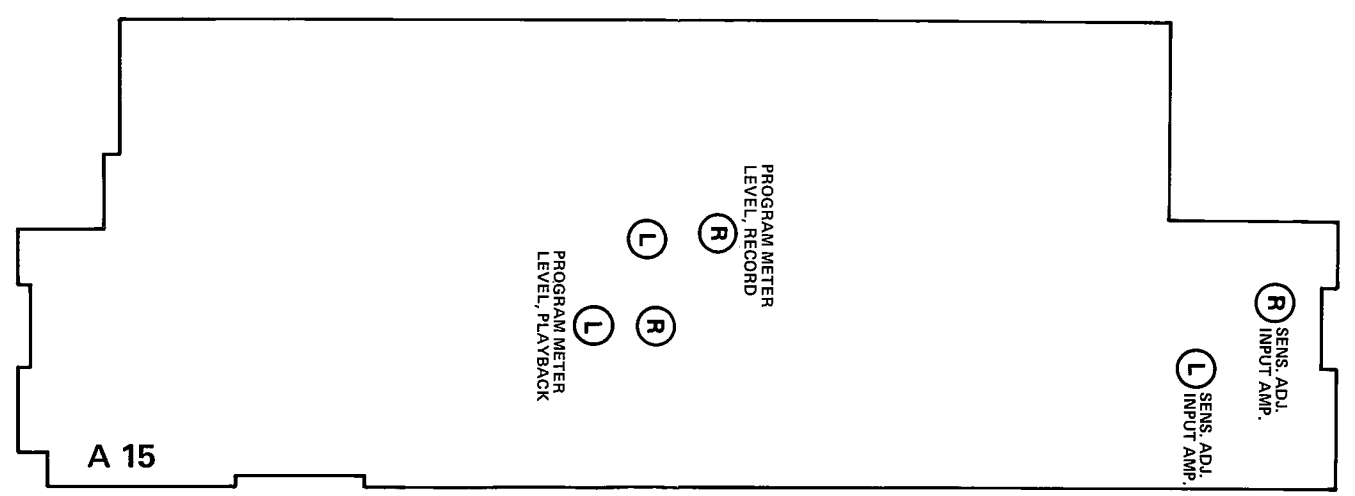
Set the deck to Record and record for about half a minute. Wind back the cassette and set the TCD 3004 to Play.

Measure on the Play sockets:
Record/playback (DIN): $< 0.12\%$
Record/playback (RMS): $< 0.09\%$.

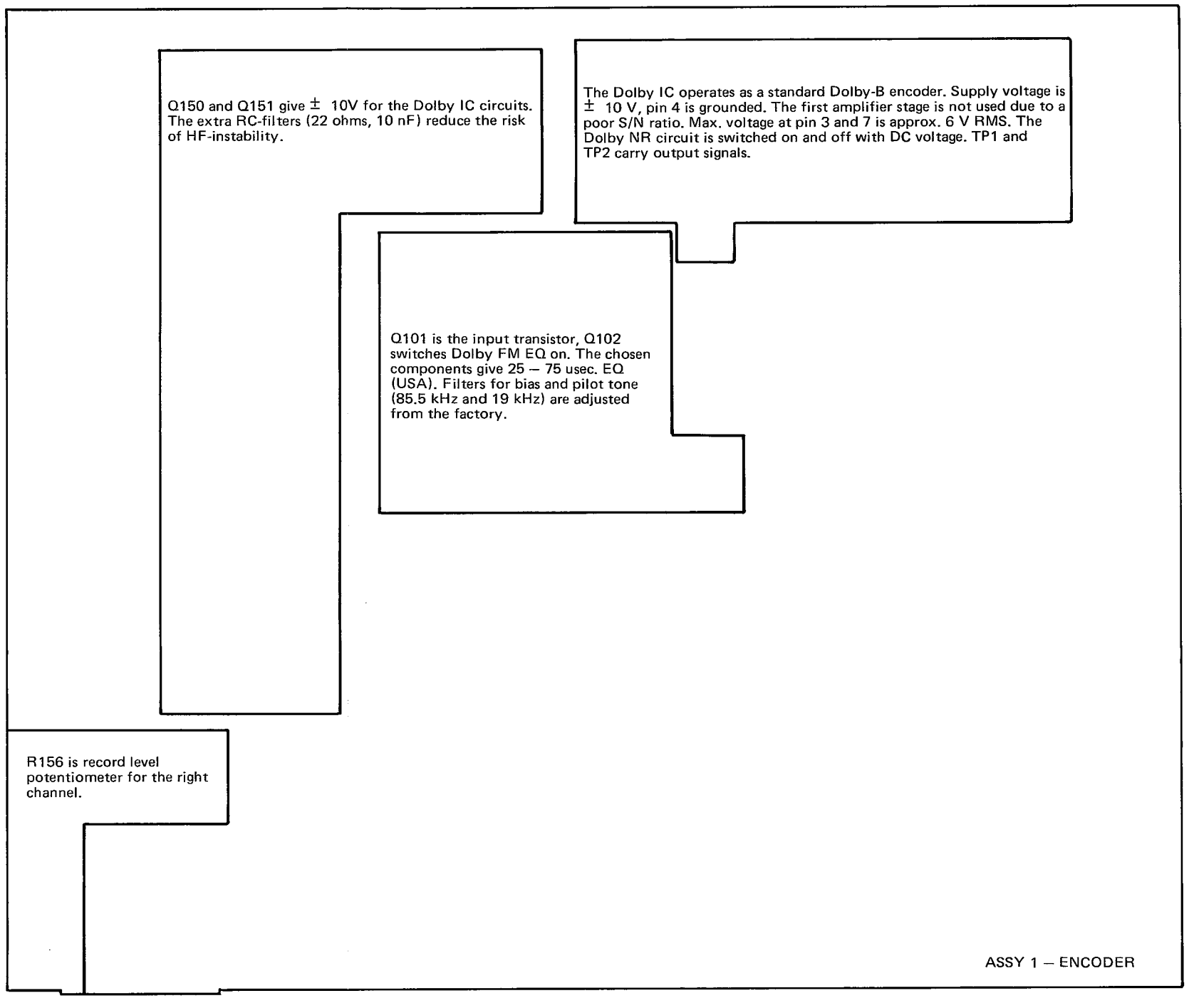






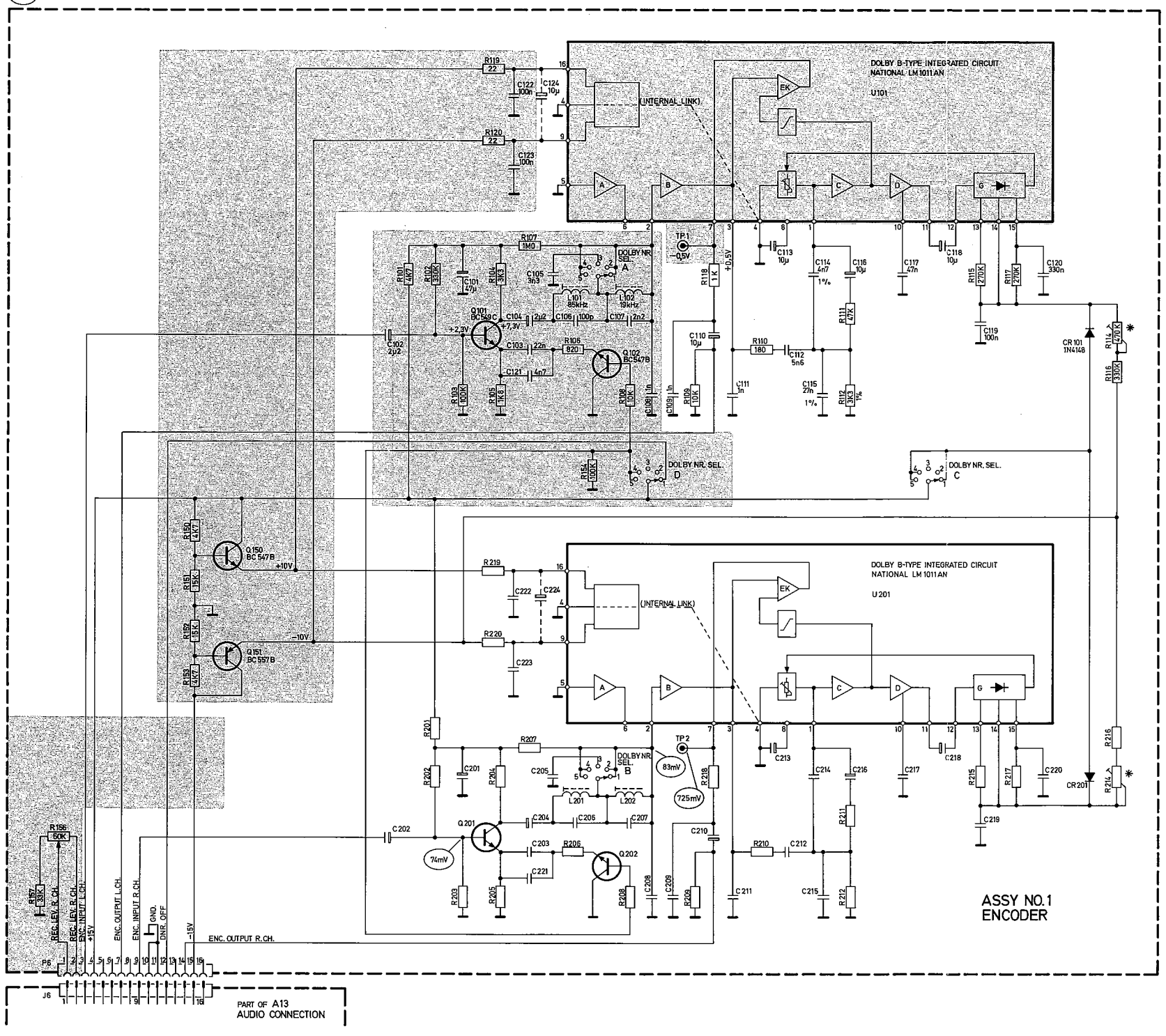


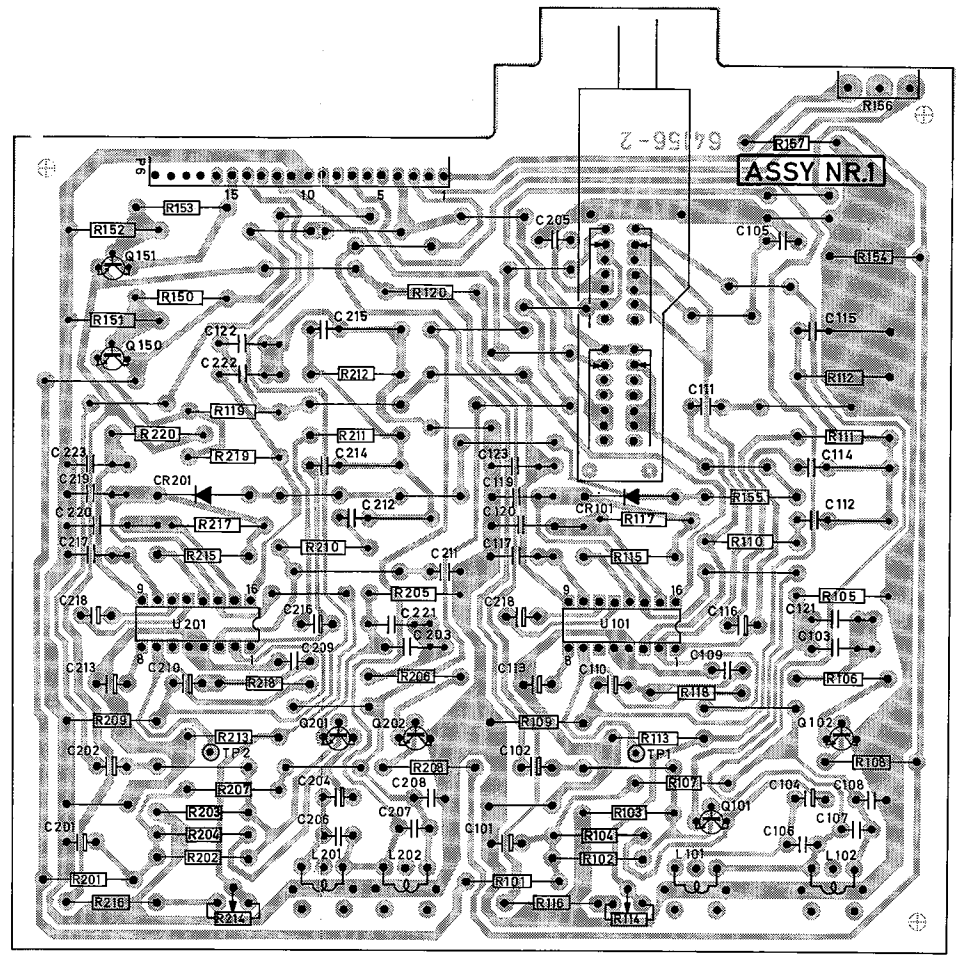
LOCATION OF TRIMMING POTS. ON THE MAIN BOARD, SEEN FROM THE COMPONENT SIDE.


Q150 and Q151 give ± 10V for the Dolby IC circuits. The extra RC-filters (22 ohms, 10 nF) reduce the risk of HF-instability.
The Dolby IC operates as a standard Dolby-B encoder. Supply voltage is ± 10 V, pin 4 is grounded. The first amplifier stage is not used due to a poor S/N ratio. Max. voltage at pin 3 and 7 is approx. 6 V RMS. The Dolby NR circuit is switched on and off with DC voltage. TP1 and TP2 carry output signals.
Q101 is the input transistor, Q102 switches Dolby FM EQ on. The chosen components give 25 – 75 usec. EQ (USA). Filters for bias and pilot tone (85.5 kHz and 19 kHz) are adjusted from the factory.
R156 is record level potentiometer for the right channel.
ASSY 1 – ENCODER

1mV DENOTES DC VOLTAGES

(1mV) DENOTES SIGNAL VOLTAGES (1000Hz)





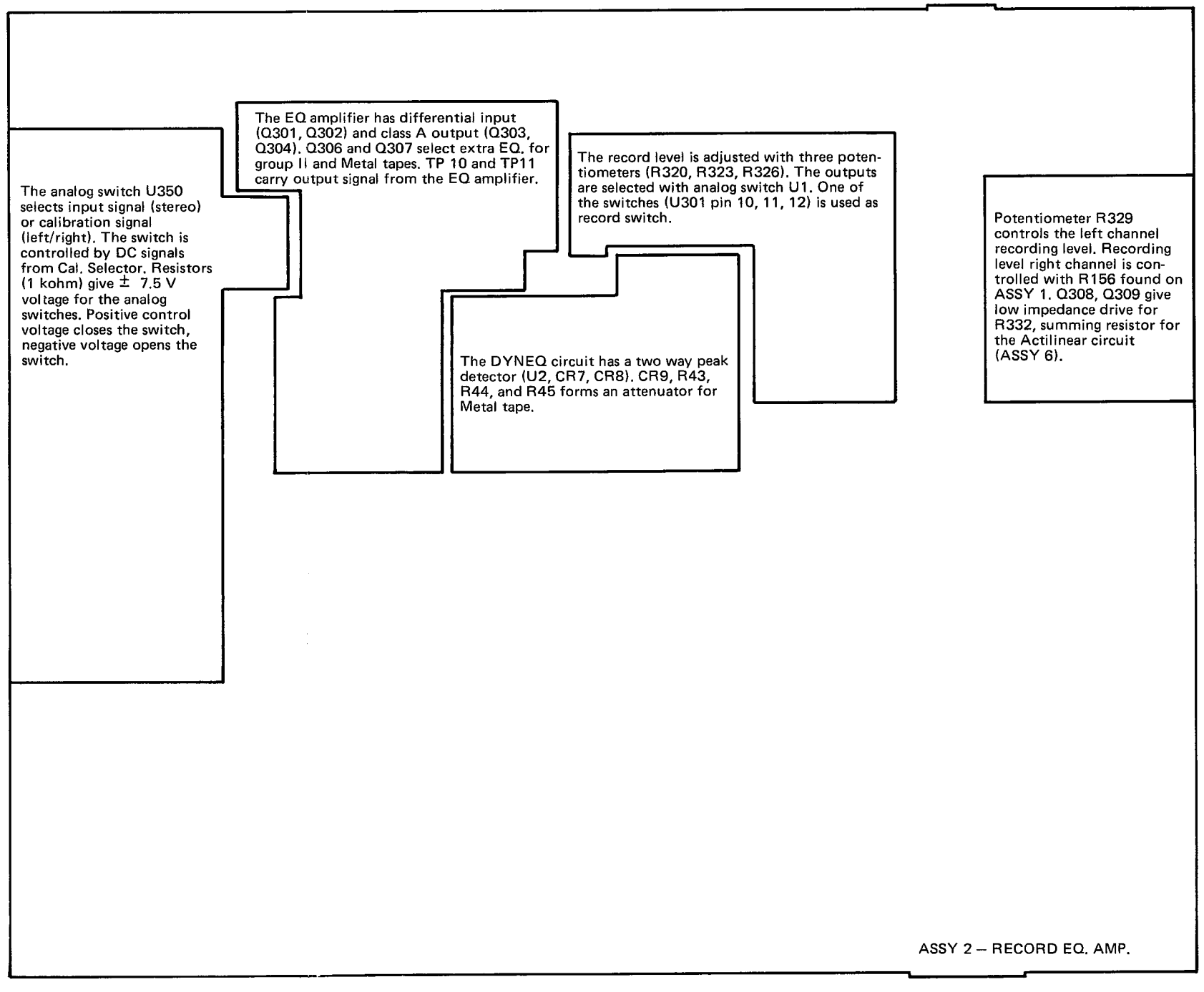
ALL THE BOARDS ARE SEEN FROM THE SOLDER SIDE.

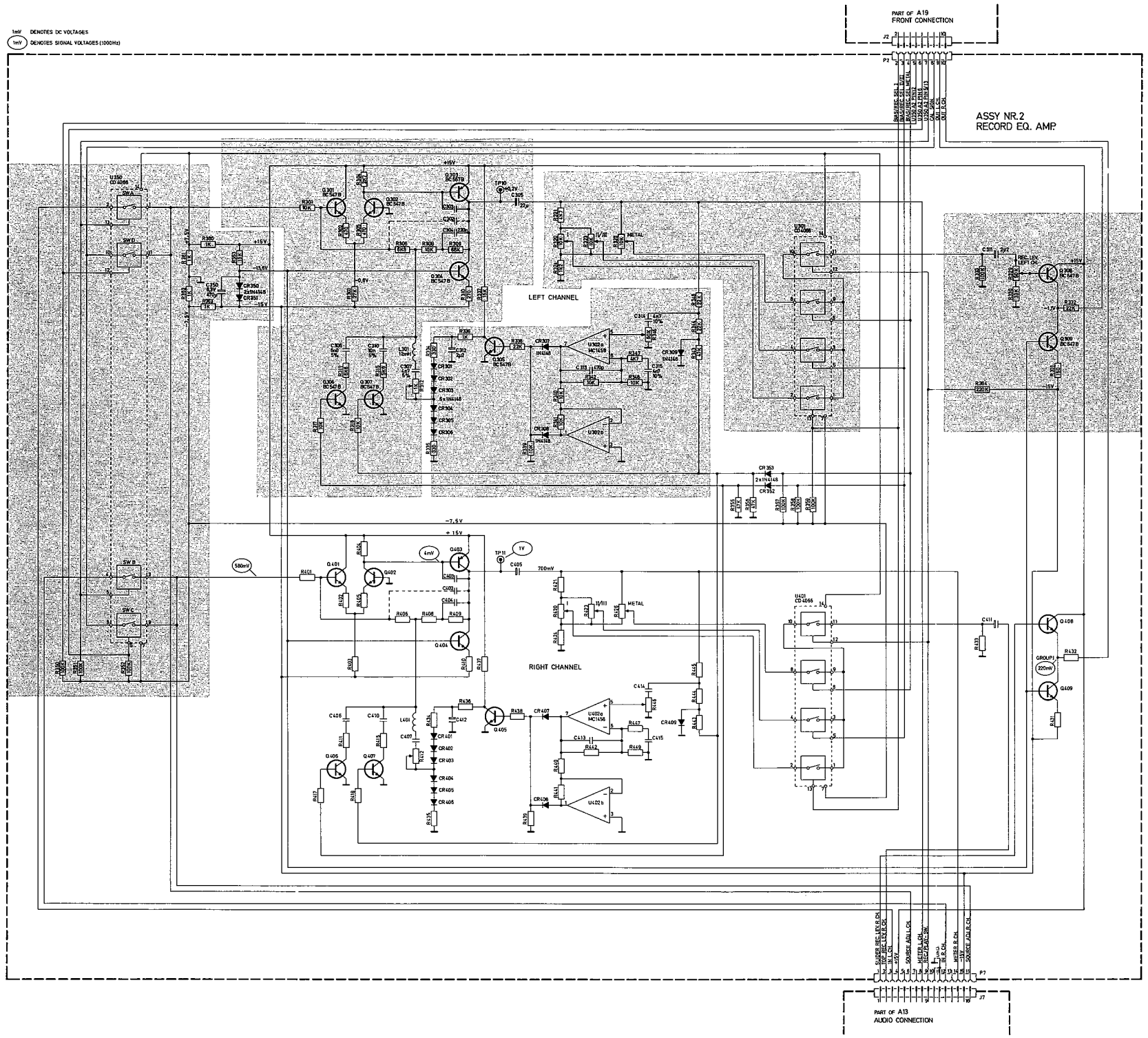
* R114/R214: ADJUSTMENT OF DETECTOR SENSITIVITY, FACTORY ADJUSTED.

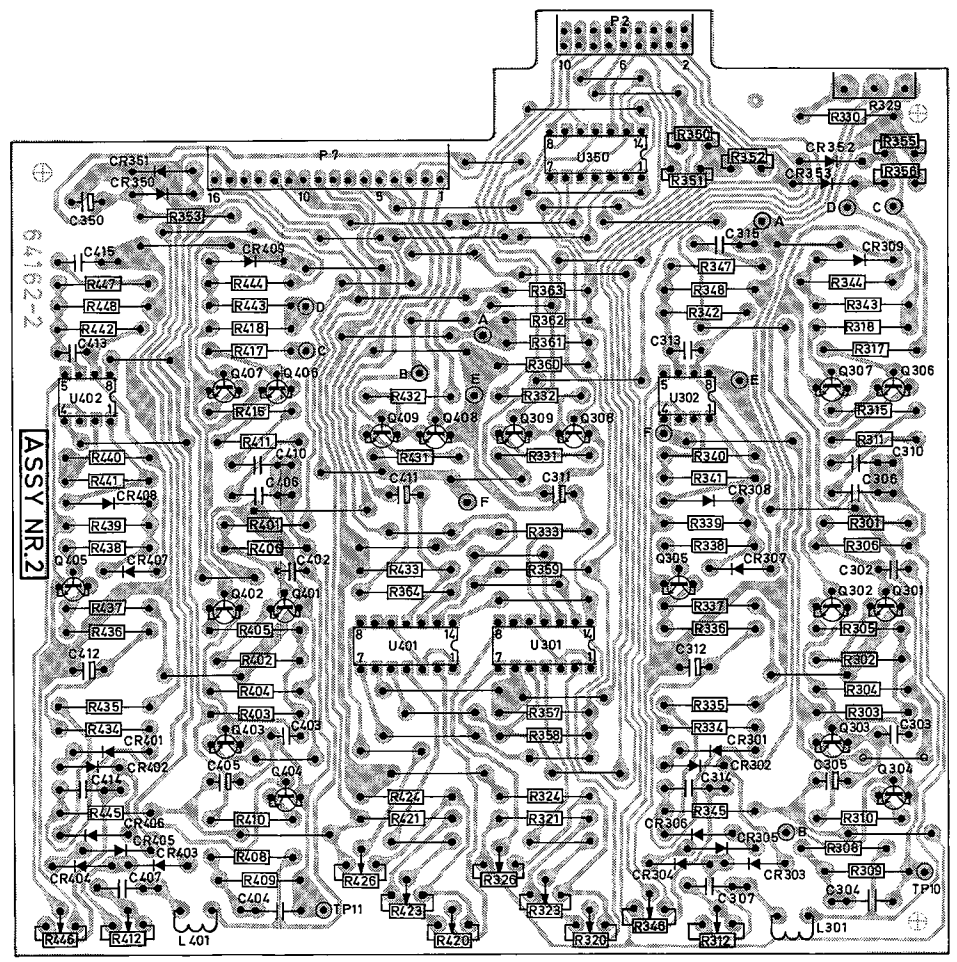
DOLBY NR.SEL.

OFF
NORMAL
NORMAL/FILTER ON
DOLBY FM/FILTER ON
DOLBY FM

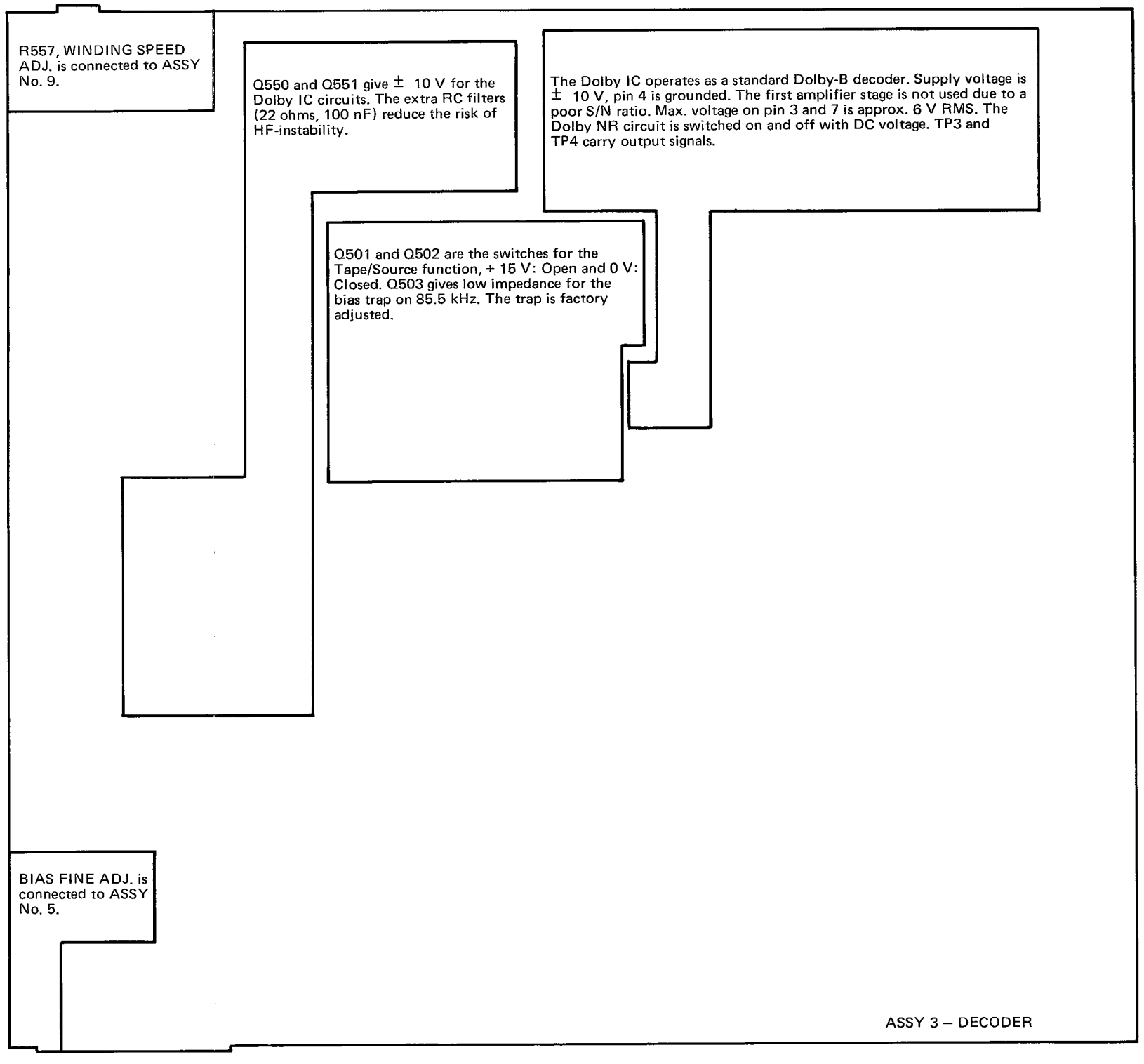
ASSEMBLY No. 1, ENCODER

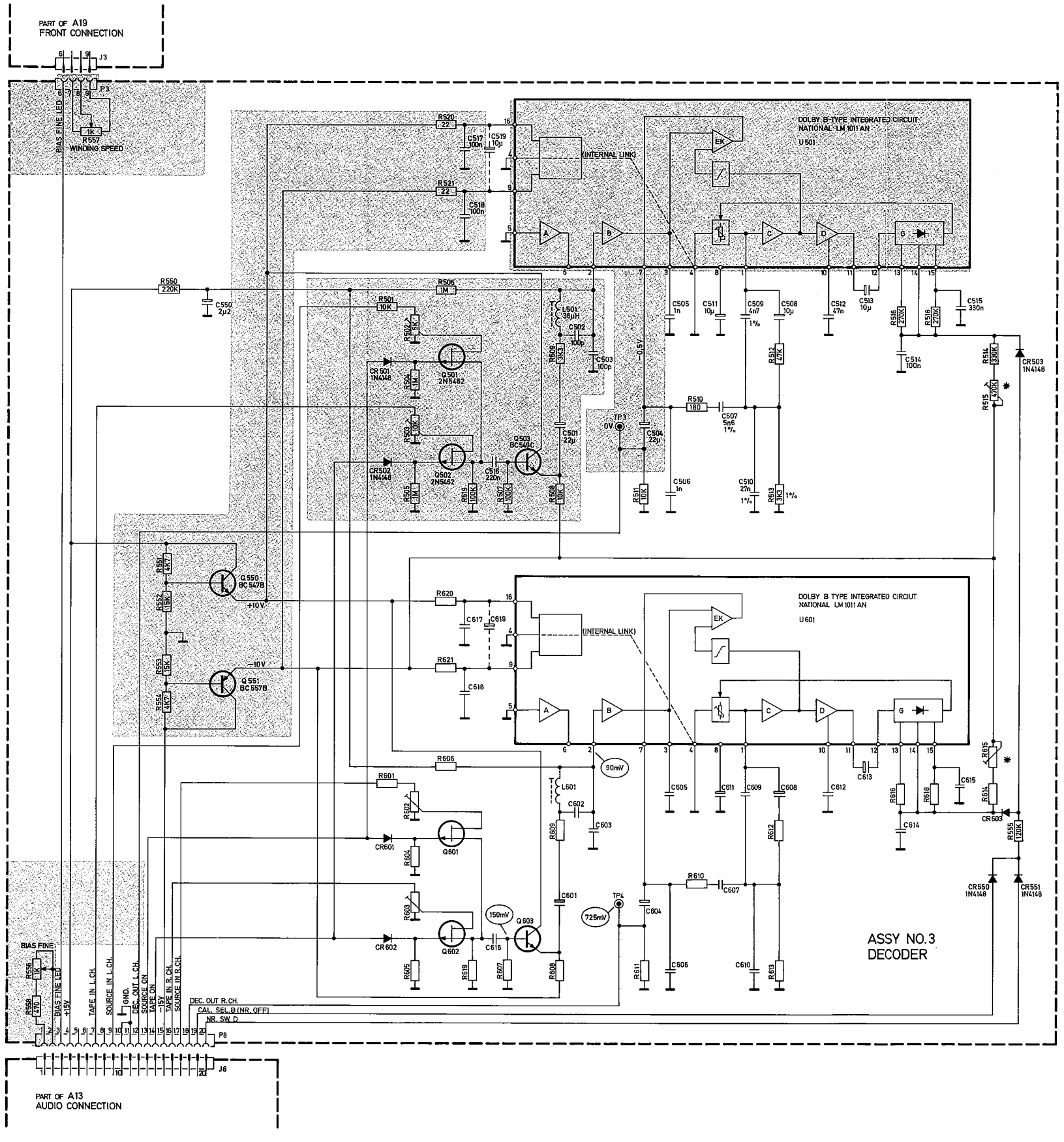

The analog switch U350 selects input signal (stereo) or calibration signal (left/right). The switch is controlled by DC signals from Cal. Selector. Resistors (1 kohm) give ± 7.5 V voltage for the analog switches. Positive control voltage closes the switch, negative voltage opens the switch.
The EQ amplifier has differential input (Q301, Q302) and class A output (Q303, Q304). Q306 and Q307 select extra EQ. for group II and Metal tapes. TP 10 and TP11 carry output signal from the EQ amplifier.
The record level is adjusted with three potentiometers (R320, R323, R326). The outputs are selected with analog switch U1. One of the switches (U301 pin 10, 11, 12) is used as record switch.
The DYNEQ circuit has a two way peak detector (U2, CR7, CR8). CR9, R43, R44, and R45 forms an attenuator for Metal tape.
Potentiometer R329 controls the left channel recording level. Recording level right channel is controlled with R156 found on ASSY 1. Q308, Q309 give low impedance drive for R332, summing resistor for the Actilinear circuit (ASSY 6).
ASSY 2 – RECORD EQ. AMP.

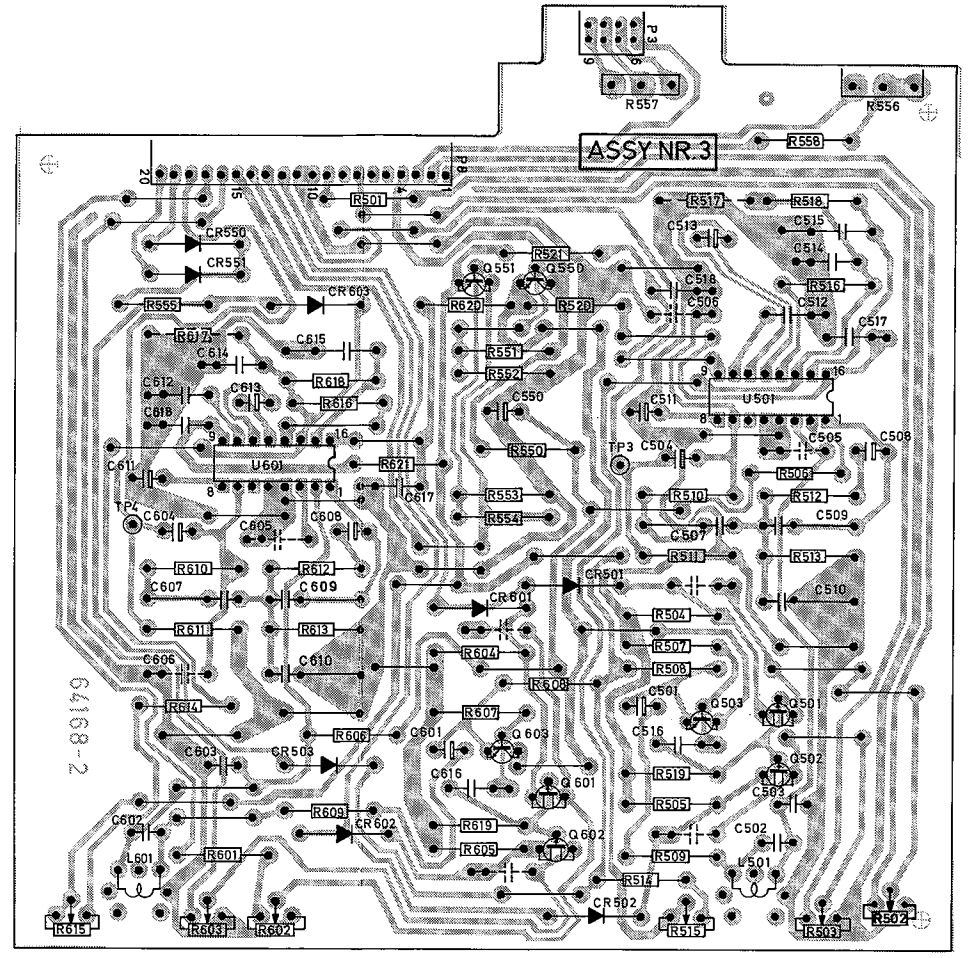




ASSEMBLY No. 2, RECORD EQ. AMP.


R557, WINDING SPEED ADJ. is connected to ASSY No. 9.
Q550 and Q551 give ± 10 V for the Dolby IC circuits. The extra RC filters (22 ohms, 100 nF) reduce the risk of HF-instability.
The Dolby IC operates as a standard Dolby-B decoder. Supply voltage is ± 10 V, pin 4 is grounded. The first amplifier stage is not used due to a poor S/N ratio. Max. voltage on pin 3 and 7 is approx. 6 V RMS. The Dolby NR circuit is switched on and off with DC voltage. TP3 and TP4 carry output signals.
Q501 and Q502 are the switches for the Tape/Source function, + 15 V: Open and 0 V: Closed. Q503 gives low impedance for the bias trap on 85.5 kHz. The trap is factory adjusted.
BIAS FINE ADJ. is connected to ASSY No. 5.
ASSY 3 – DECODER





1mV DENOTES DC VOLTAGES
(1mV) DENOTES SIGNAL VOLTAGES (1000Hz)

*
R515/R615:
ADJUSTMENT OF DETECTOR SENSITIVITY, FACTORY ADJUSTED.

ASSEMBLY No. 3, DECODER

The playback amplifier is a 3 stage amplifier. Stage 1 (Q701, Q702, Q703) is a standard 120 – 70 μsec. playback amplifier. Stage 2 (Q704) is a second order low pass filter with approx. 10 dB gain at the crossover frequency. R713 adjusts the frequency from approx. 21 to 29 kHz. Q709 switches C706 in during wind and rewind to reduce the high frequency on the output sockets. Stage 3 has constant gain of 11x (R723, R724). C709, R716, R721, R722 is a phase shifting network.

NOTE! A 1 kohm resistor (R733) is inserted in series with C6 to prevent instability.

Q708 works as a ripple filter.

Q750, Q751, Q752 operate as a program detector. The program detector is not used, and the input (R751) is grounded.

ASSY 4 – PLAYBACK

1mV DENOTES DC VOLTAGES

(1mV) DENOTES SIGNAL VOLTAGES (1000 Hz)

PART OF A19
FRONT CONNECTION

J4 P4

REW LED
WIND LED
PLAY LED
+5V
+15V

ASSY NO.4
PLAYBACK

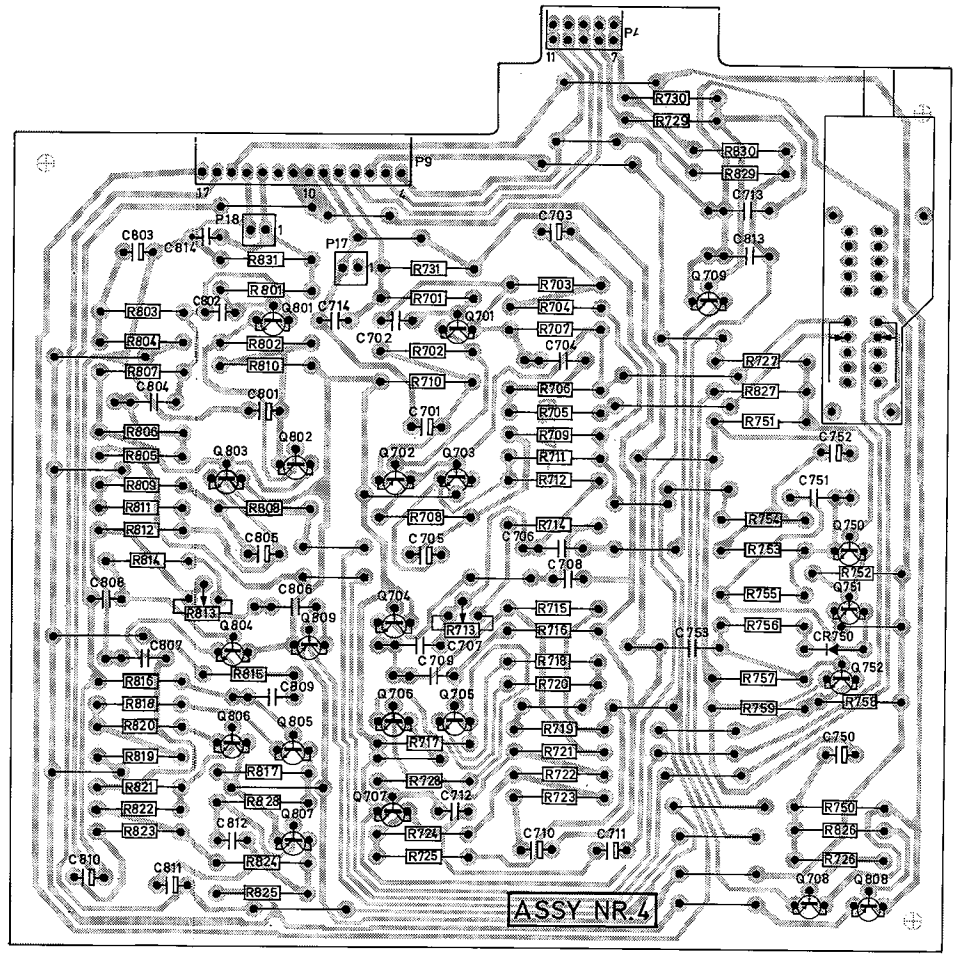
P9

J9

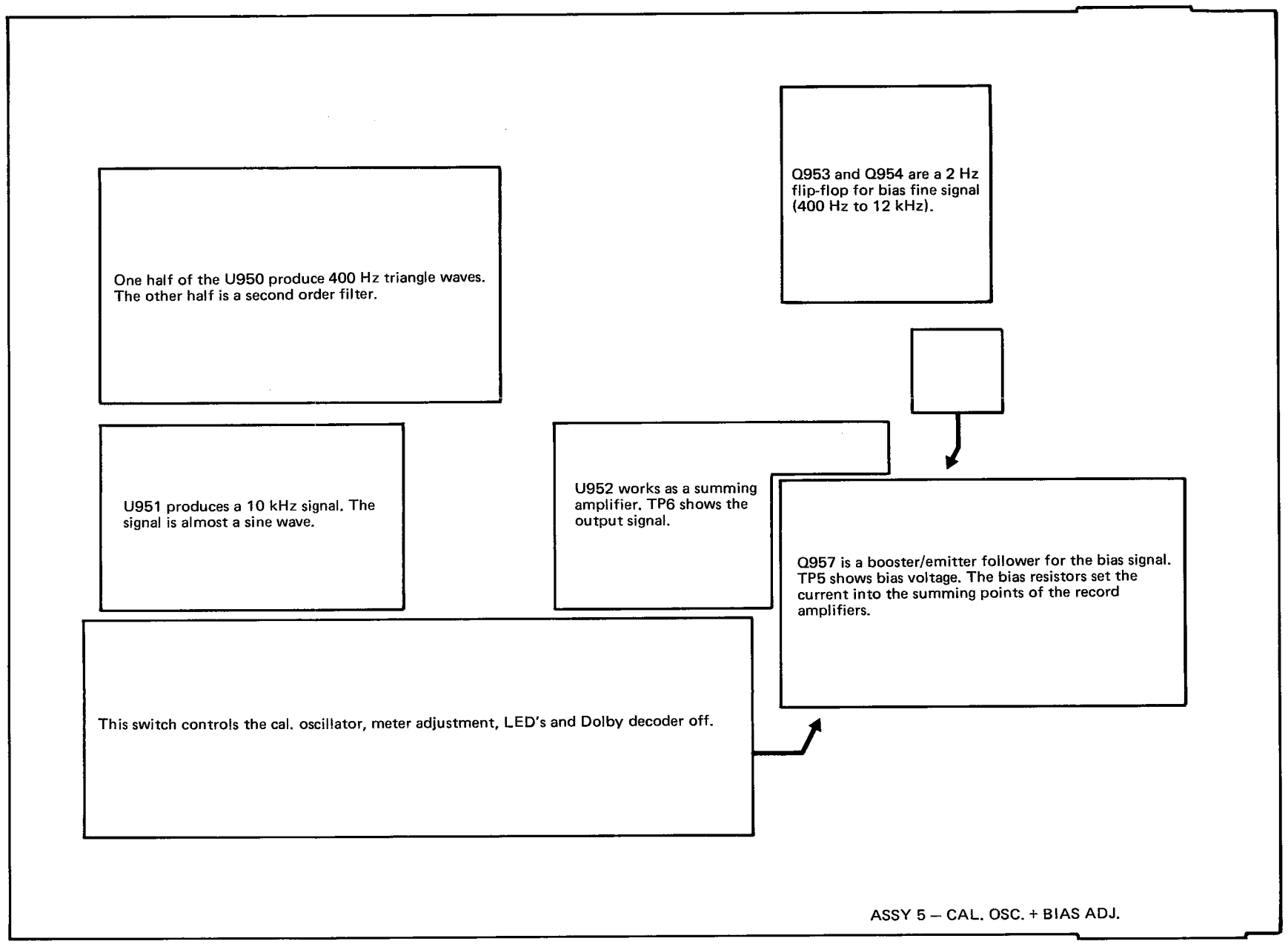
PART OF A13
AUDIO CONNECTION

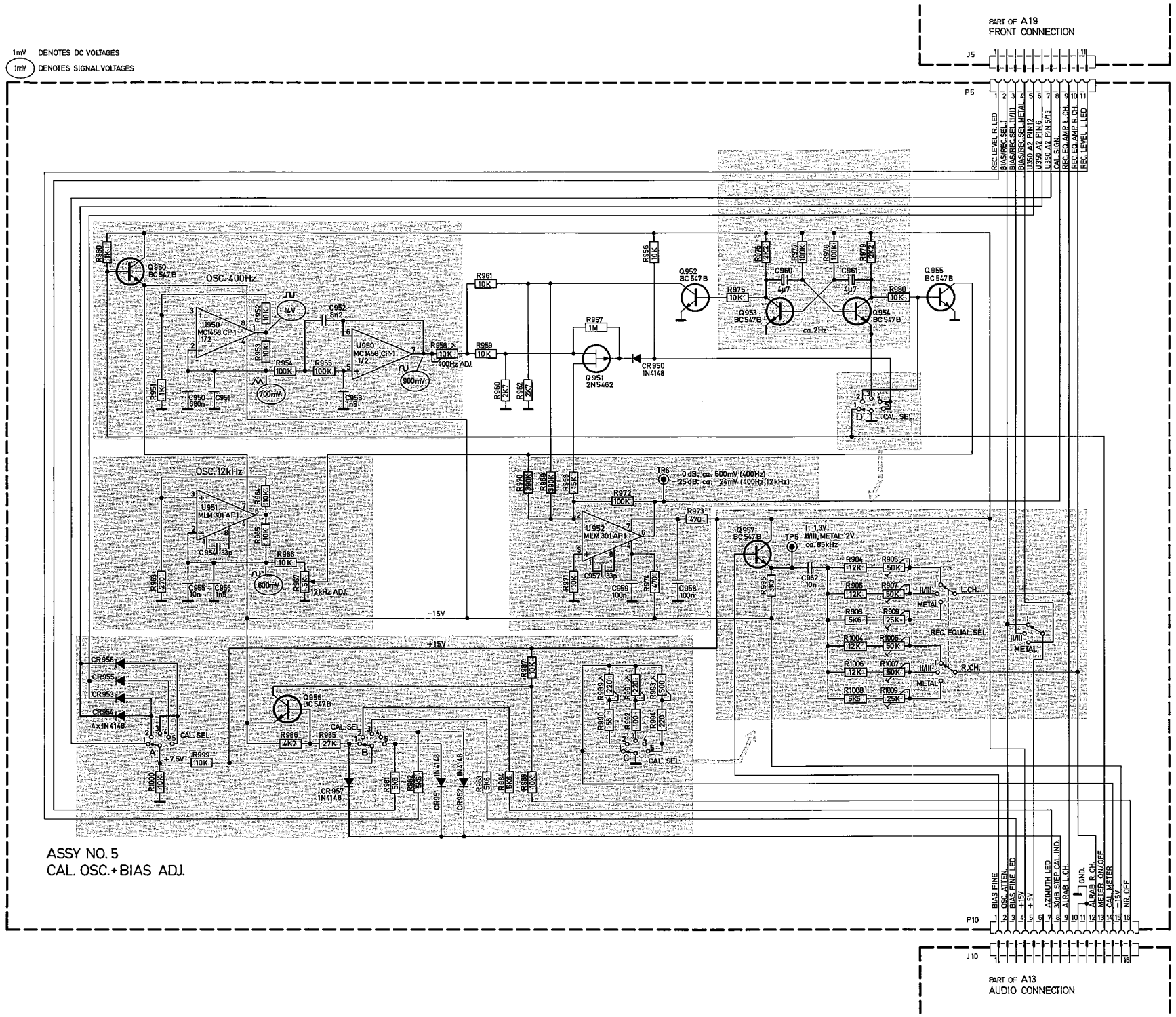
J16

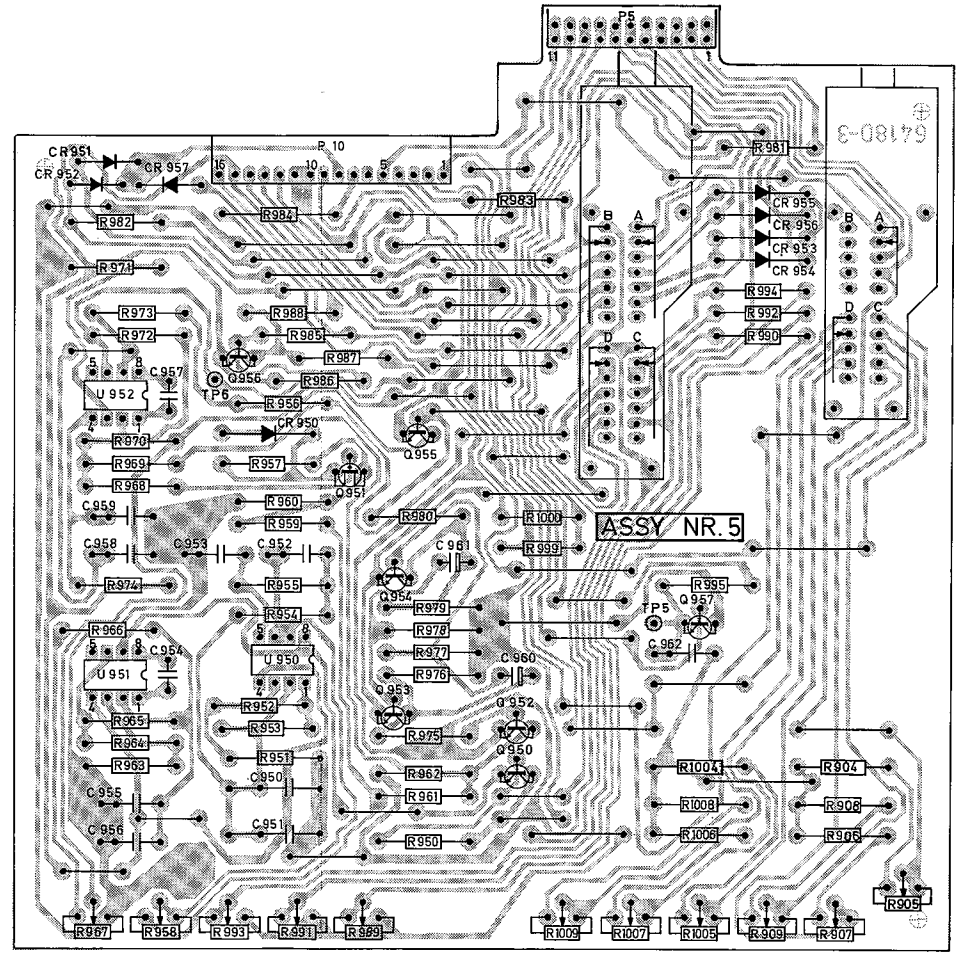
LEFT
RIGHT
PLAYBACK HEAD



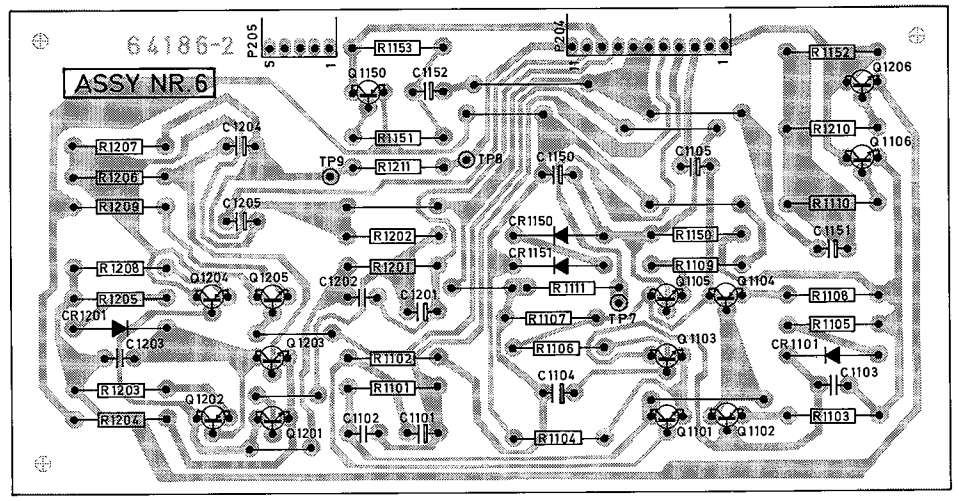
ASSEMBLY No. 4, PLAYBACK

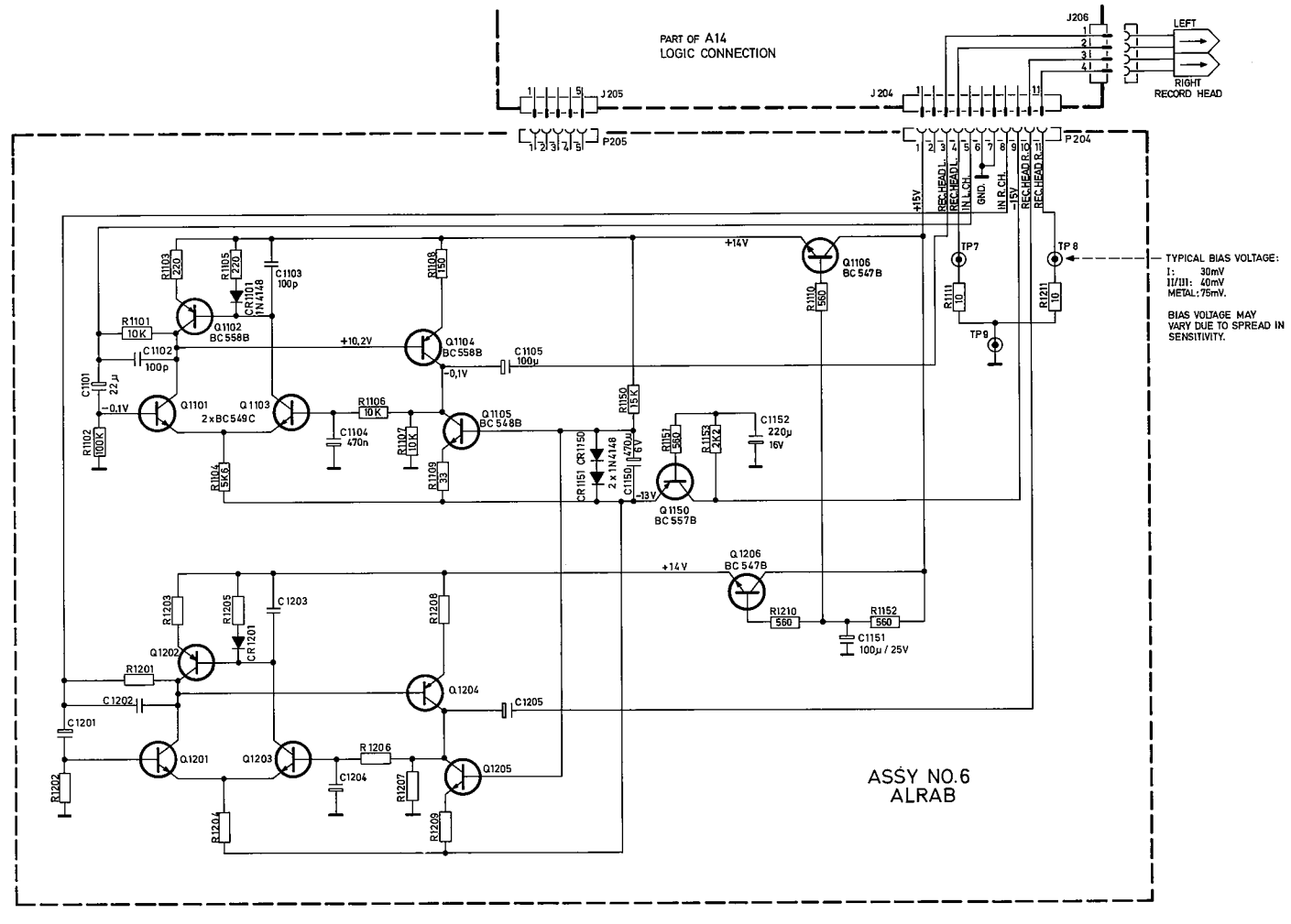

One half of the U950 produce 400 Hz triangle waves. The other half is a second order filter.
Q953 and Q954 are a 2 Hz flip-flop for bias fine signal (400 Hz to 12 kHz).
U951 produces a 10 kHz signal. The signal is almost a sine wave.
U952 works as a summing amplifier. TP6 shows the output signal.
Q957 is a booster/emitter follower for the bias signal. TP5 shows bias voltage. The bias resistors set the current into the summing points of the record amplifiers.
This switch controls the cal. oscillator, meter adjustment, LED's and Dolby decoder off.
ASSY 5 – CAL. OSC. + BIAS ADJ.





ASSEMBLY No. 5, CAL. OSC. + BIAS ADJ.



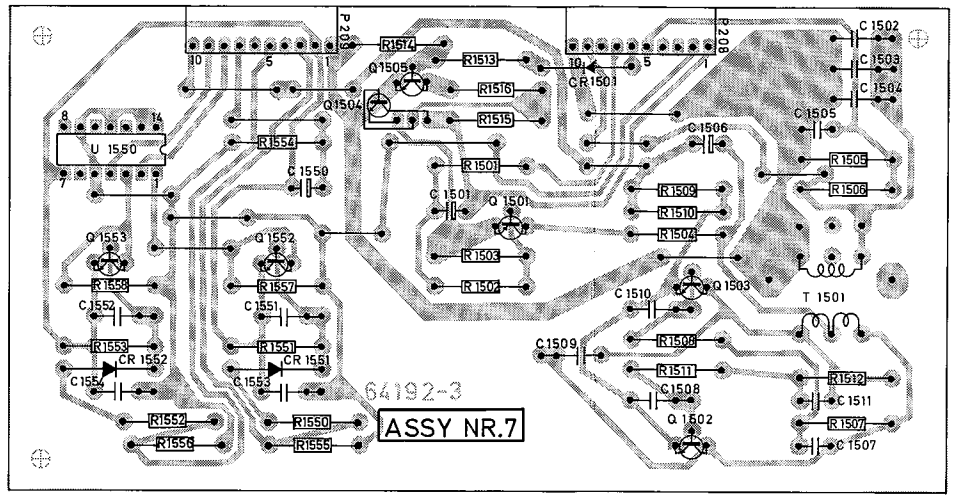


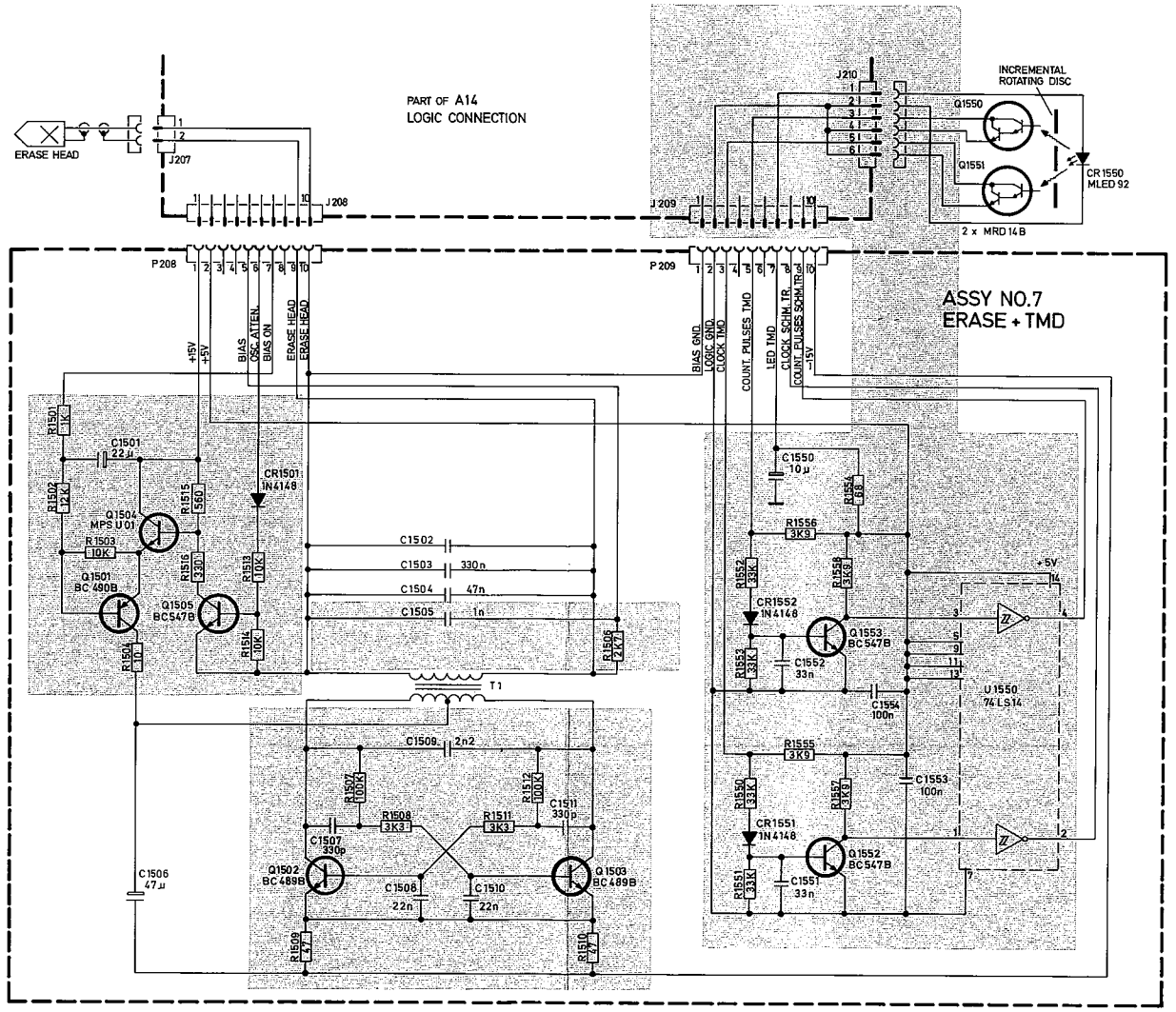
Q1101, Q1102, and Q1103 are a summing amplifier. Q1104 and Q1105 are the actilinear amplifier that deliver both record and bias current. The base on Q1101 is the summing point. Q1101 is the first and Q1103 is the other half of the differential stage. Together with R1106, R1107, C1104, and C1105 it forms a high pass filter with second order roll-off below 15 kHz.

Q1106, Q1206, and Q1150 isolate the supply voltage from ripple and noise. TP7, TP8, and TP9 show typical record and bias current.
The voltage is approx.:
Type I tape: 30 mV
Type II/III tapes: 40 mV
Metal tape: 75 mV

ASSY 6 – ALRAB (actilinear recording and biasing)

ASSEMBLY No. 6, ALRAB





ASSY 7 – ERASE AND TMD (tape moving detector)

Q1501 is the on/off switch for the oscillator. Q1504 and Q1505 is an attenuator for Type I tape.

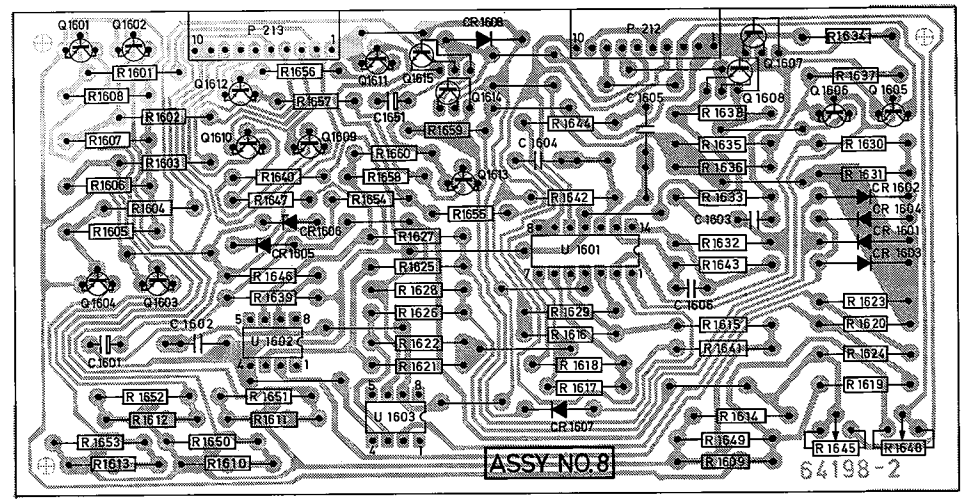
R1506 and C1505 are a low pass filter for the bias voltage.

Q1502 and Q1503 form a conventional push-pull oscillator. Secondary voltage is approx. 8.5 V (5.5 V in Type I tape). The oscillator frequency is approx. 84 to 87 kHz.

Q1550 and Q1551 produce out-of-phase square waves for the tape counter. Q1552 (Q1553) and CR1551 (CR1552) are a detector/amplifier. U1550 is a Schmitt trigger and inverter.

NOTE! Check on the output of U1550 for out-of-phase 5 V square waves. The plastic housing for Q1550 and Q1551 is sensitive to incorrect mounting.

ASSEMBLY No. 7, ERASE + TMD.



Transforms the binary input signal to the actual referance voltage U_{ref}.

A

Compares U_{ref} with the voltage on the slider of the pos. potentiometer. The voltage difference is amplified 3.3 times and referred to ground. If the output voltage exceeds ±1.4 V the servo motor will start to operate.

B

Determines the "dead-zone" at the system. Outputs a reference voltage for the speed and the direction of rotation at the servo motor.

C

Feedbacks to microprocessor the state of the system.

G

F Hum cancelling network.

Voltage on the slider of pos. potentiometer is fed to the input of the comparator (B) and the differentiator (E).

D

Measures the speed of the servo motor by outputing a voltage proportional to the rate of change at the voltage on the pos. potentiometer slider. Stabilizes the operation of the whole servo system.

E

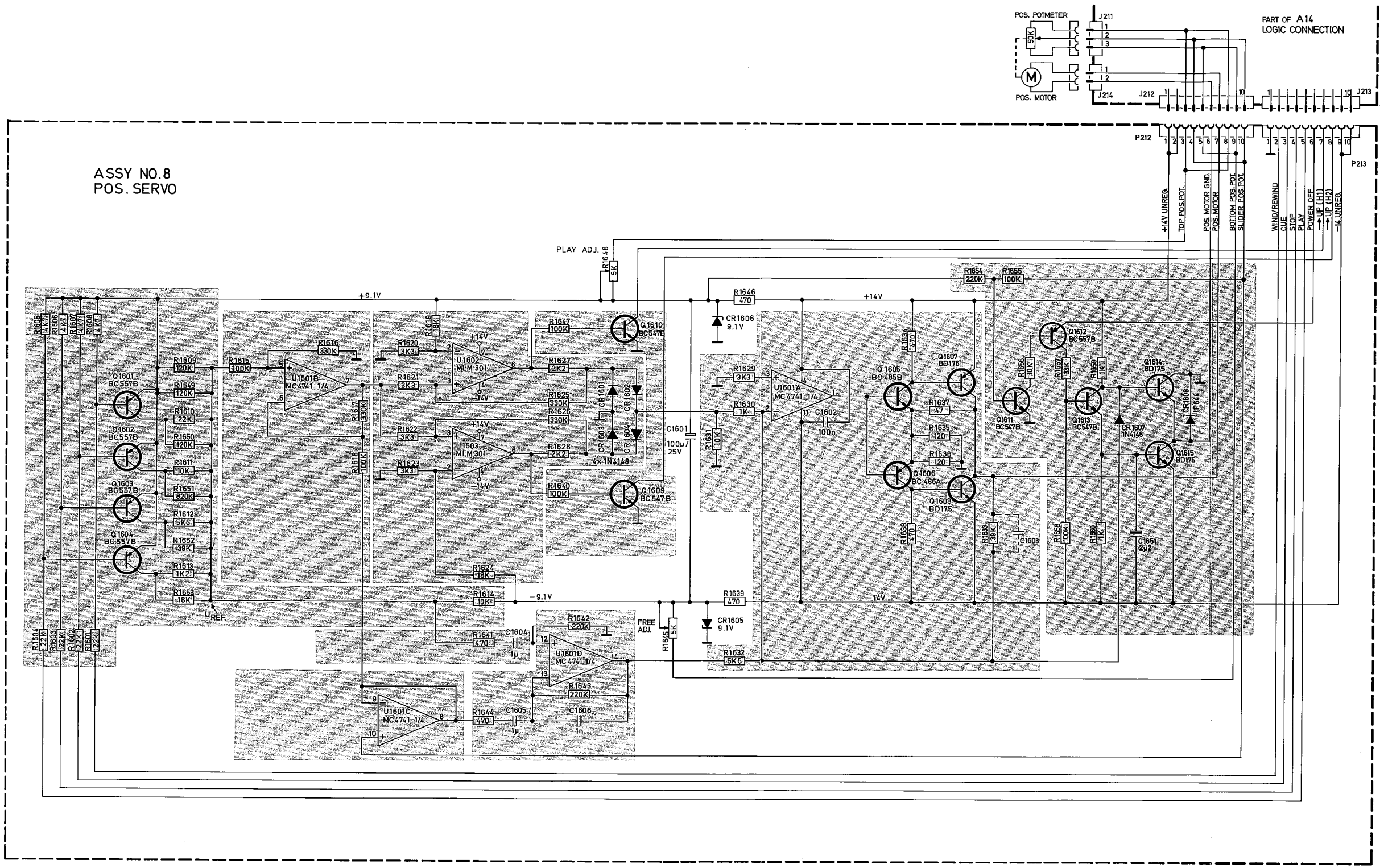
Voltage at A is a referance voltage for direction of rotation and speed of the servo motor.

H

Power off circuit supplies the pos. motor ground terminal with 10 to 14 V when the pos. motor is in any other position than Release during power off. A1611 gets positive base voltage when P212-10 is higher than – 7 V. When the power is switched off Q1612, Q1613, and Q1615 conduct, and the Q1614 is switched off. Pos. motor will now get more than 25 V and run quickly towards release position.

I

ASSY 8 – POS. SERVO

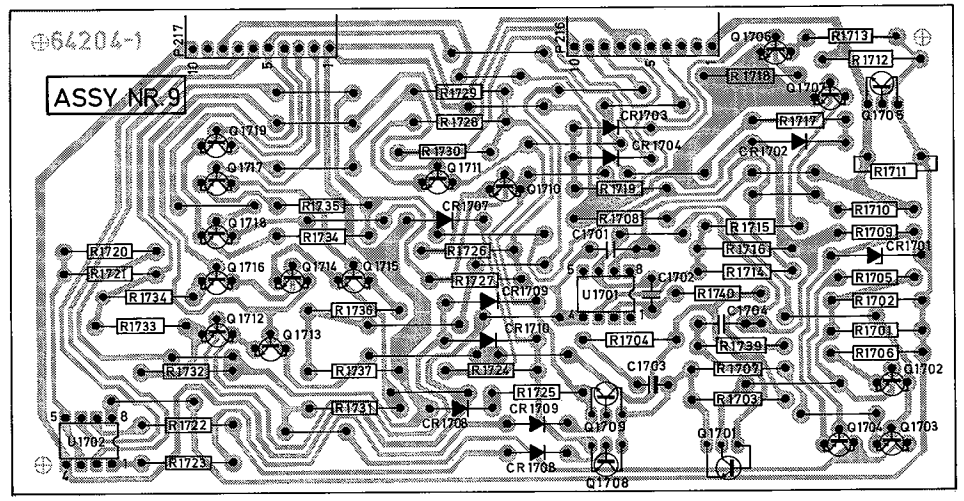


	PLAY	STOP	CUE	W/REW	FREE
P 213-2	1	1	1	0	1
P 213-3	1	1	0	1	1
P 213-4	1	0	1	1	1
P 213-5	0	1	1	1	1
$U_{REF.}$	+6,9V	+3,3V	+0,7V	−1,6V	−7,1V

0 = +0,1V APPROX.
1 = +9,1V APPROX.

	H1	H2
IN POS. :	5V	0V
POS. MOTOR RUNS TOWARDS PLAY POS. :	0V	0V
POS MOTOR RUNS TOWARDS FREE POS. :	5V	5V

ASSEMBLY No. 8, POS. SERVO



ASSY 9 — SPOOL SERVO

Increases voltage to blocks A, D, E, and F during Wind, Rewind, and Cue modes.

B

C

Controls reference voltage to motor drive amplifier. Outputs + 3.0 V in Play and tape loop tension modes. + 1.35 V elsewhere.

Supplies current to take-up motors during all modes.

A

D

Measuring speed of take-up motor during Wind, Rewind, and Cue modes and outputs a current proportional to the speed.

Current limiter. Current to take-up motor during Wind, Rewind, and Cue modes is limited to 0.5 A.

E

Electronic switching of current from motor drive amplifiers to the motors.

F

Interface to microprocession.

K

Measures the speed of supply motor during Wind, Rewind, and Cue modes. Outputs a current proportional to the speed.

G

Dynamic damping of supply motor during Wind, Rewind, and Cue modes.

I

H

Spool servo loop amplifier. Compares the voltage on the slider of the winding speed potentiometer with a voltage proportional to the sum of the speeds of the winding motors. This voltage is the results of currents from G and D passing through R1731. Outputs a current to the motor drive amplifier.

Shortcircuits the voltage on the slider at winding speed control potentiometer to —14 V-line during all other modes than Wind, Rewind, and Cue.

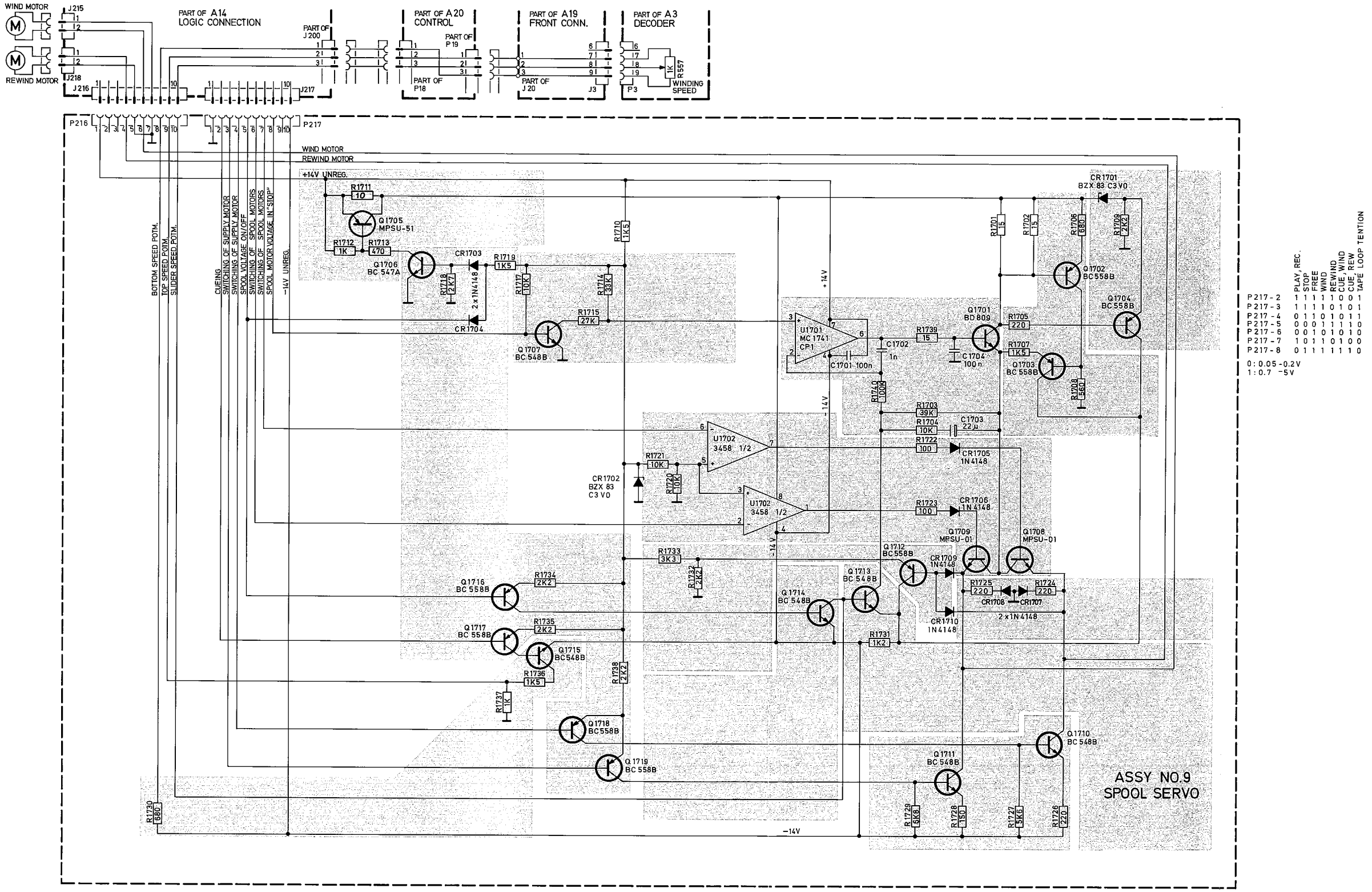
M

J

Circuits for supply motor to reduce tape tension during Play, Wind, Rewind, and Cue modes.

L

Supply voltage to winding speed control potentiometer.



	PLAY, REC.	STOP	FREE	WIND	REWIND	CUE, WIND	CUE, REW	TAPE LOOP TENTION
P217-2	1	1	1	1	1	0	0	1
P217-3	1	1	1	1	0	1	0	1
P217-4	0	1	1	0	1	0	1	1
P217-5	0	0	0	1	1	1	1	0
P217-6	0	0	1	0	1	0	1	0
P217-7	1	0	1	1	0	1	0	0
P217-8	0	1	1	1	1	1	1	0

0: 0.05 - 0.2V
1: 0.7 - 5V

ASSEMBLY No. 9, SPOOL SERVO

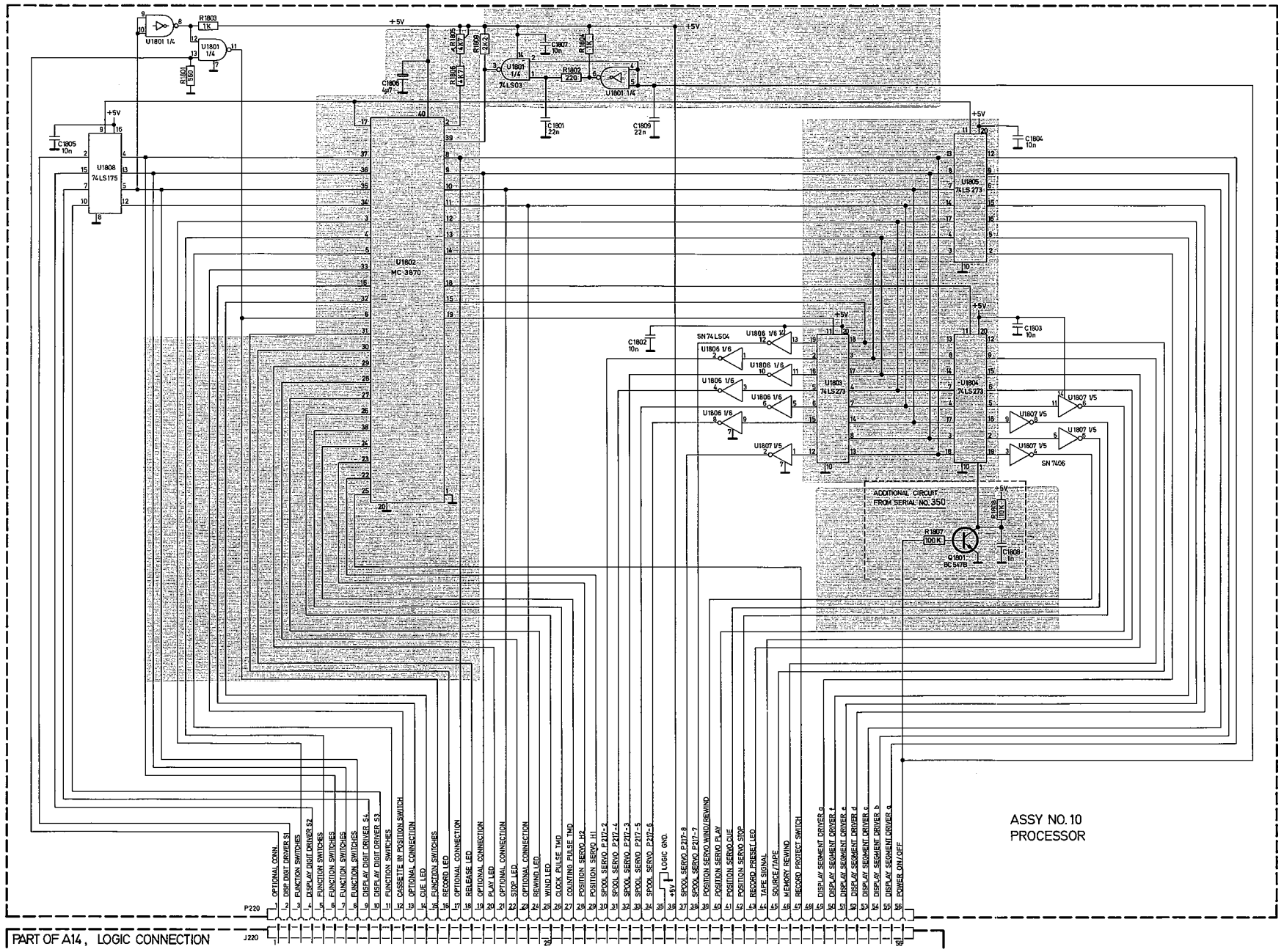
The processor gets the power-off signal on pin 39 (negative pulse) when P220-56 goes high.

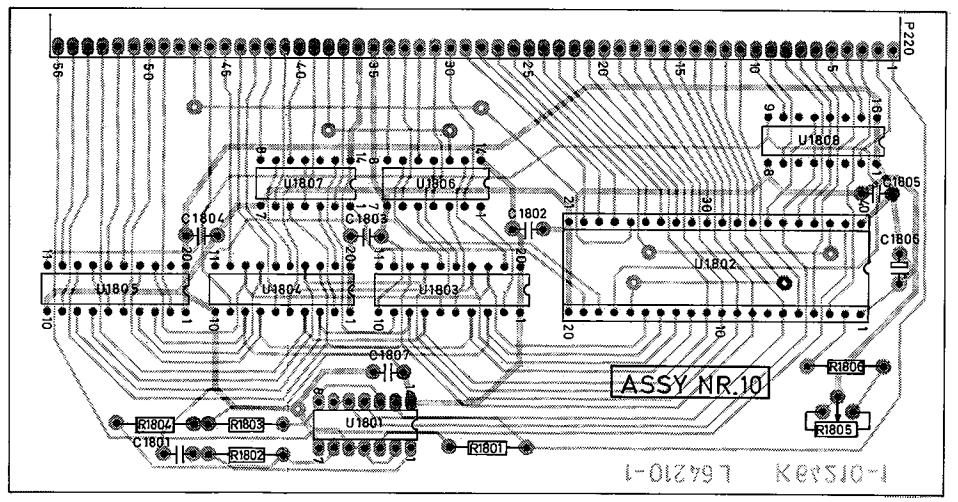
The TCD 3004 uses a MC3870 processor. The processor is 100% factory tested. R1805 sets the clock frequency approx. 3.5 to 4 MHz. The frequency is divided down to the display frequency 107 Hz, measured on P222, pin 1 to 4 on ASSY 11. The frequency is not critical. The processor has a built-in power-on detector. The voltages on P220-28 and P220-29 are critical for correct operation.
P220-28 = H2 = 0 V, in position see
P220-29 = H1 = 5 V, in position ASSY 8

The LS273 is an 8 bits latch. The input signal will be read and latched when pin 11 goes low.

Q1801 resets U1804 (master reset) during power on/off to ensure correct control signals to the pos. servo. All outputs from Q1804 are set low when pin 1 (master reset) gets a negative pulse.

ASSY 10 – PROCESSOR





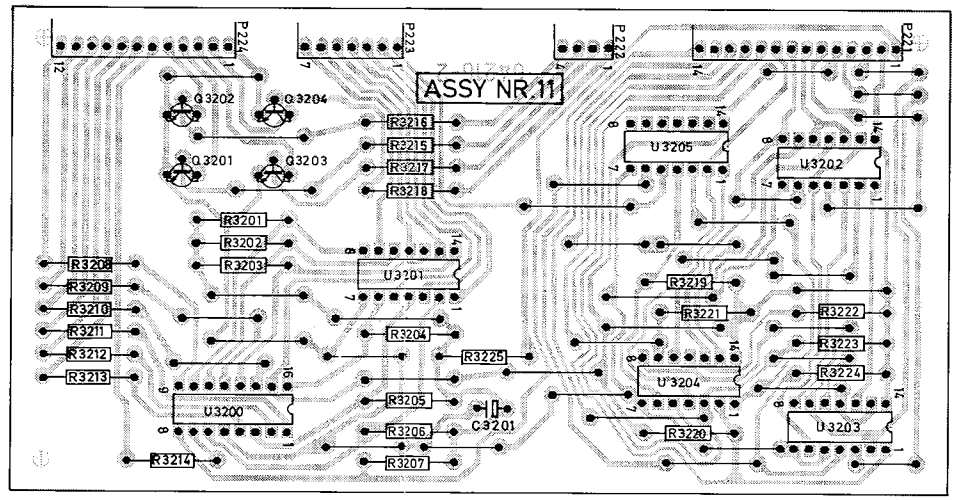
ASSEMBLY No. 10, PROCESSOR

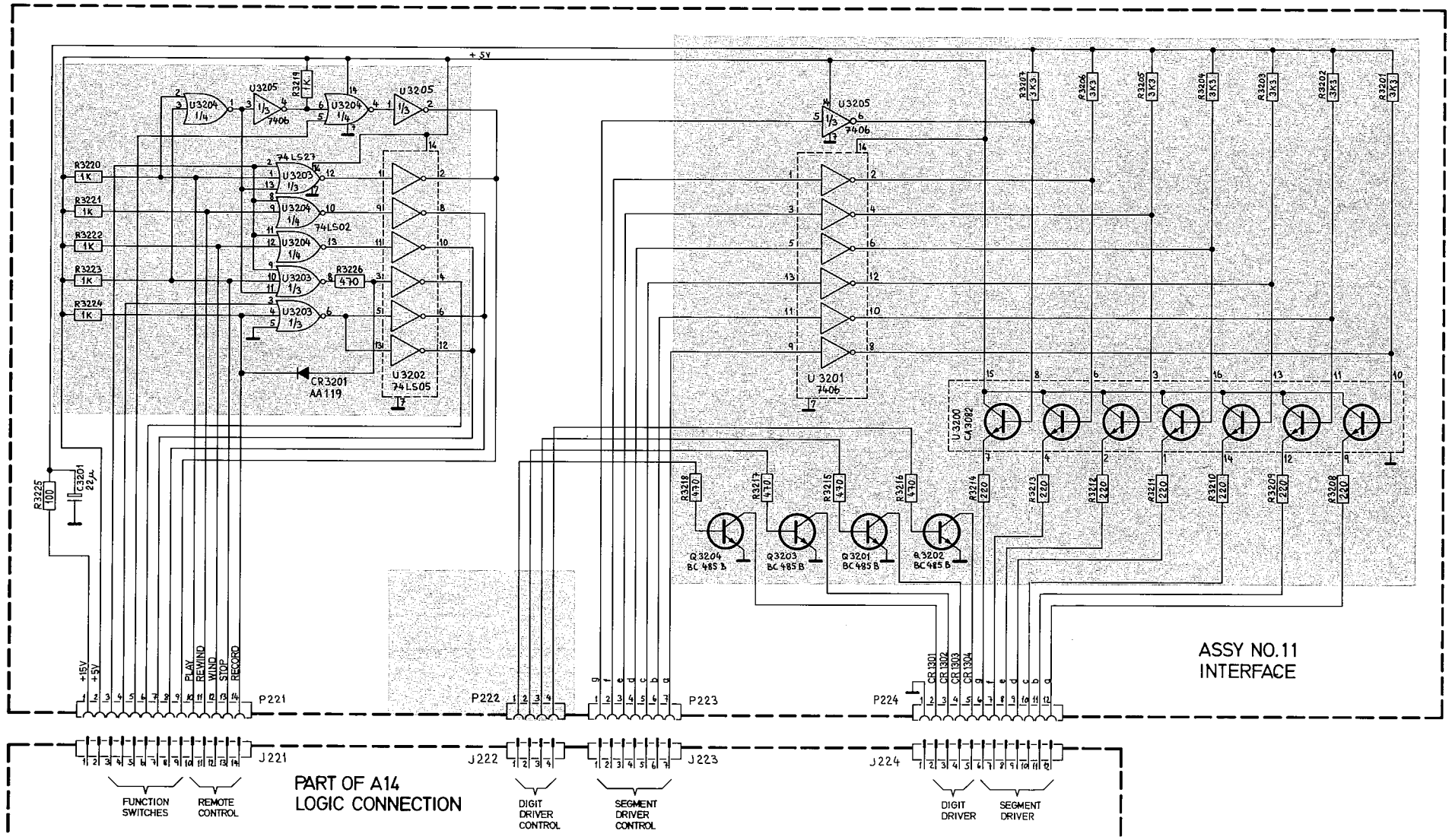
TTL signals from the remote controls must be interfaced to the processor. The control buttons on ASSY 20 and ASSY 21 are placed in a signal matrix and the remote control signals are given in parallel. See logic diagram for complete information.

The four-digit display is multiplexed by the processor. The display frequency is approx. 107 Hz, measured on P222.

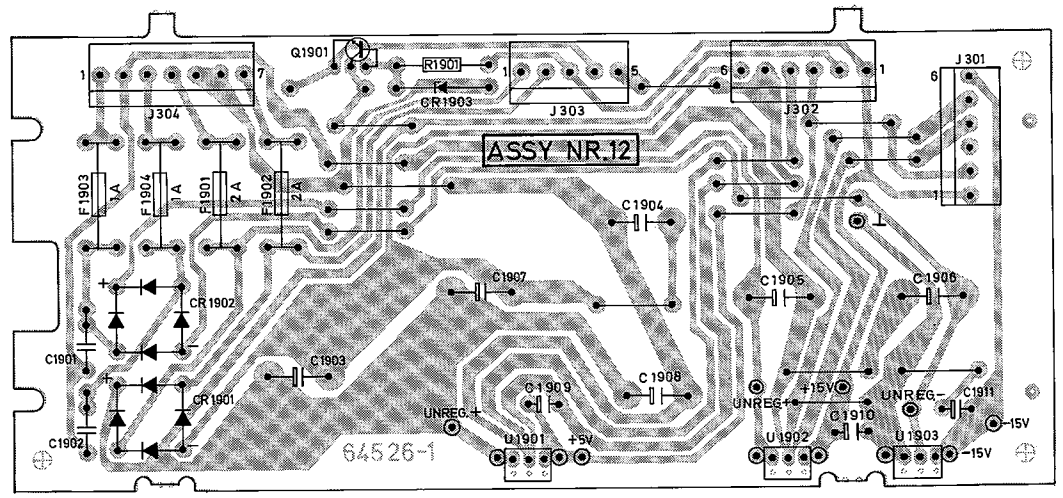
Test the display frequency at any of the inputs on J222.

ASSY 11 – INTERFACE



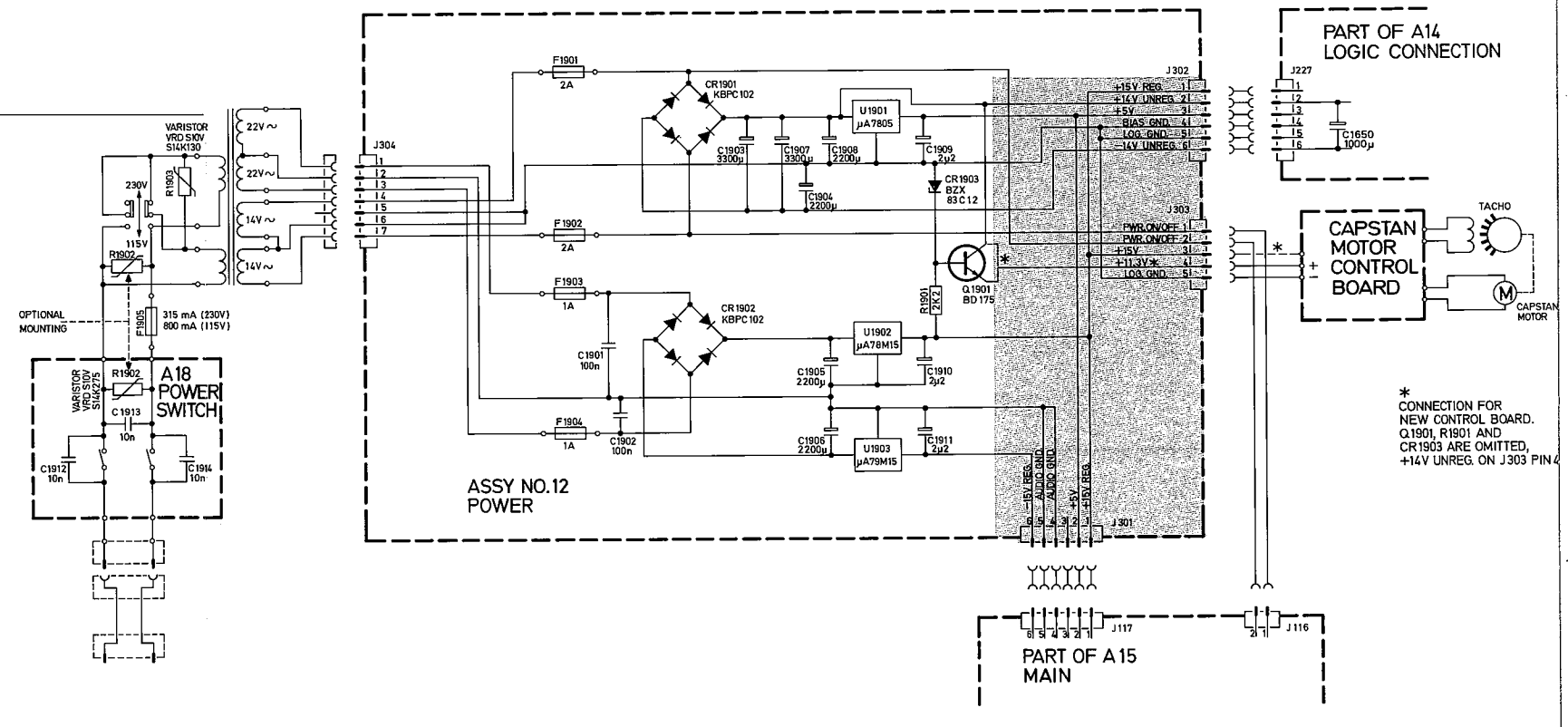


ASSEMBLY No. 11, INTERFACE

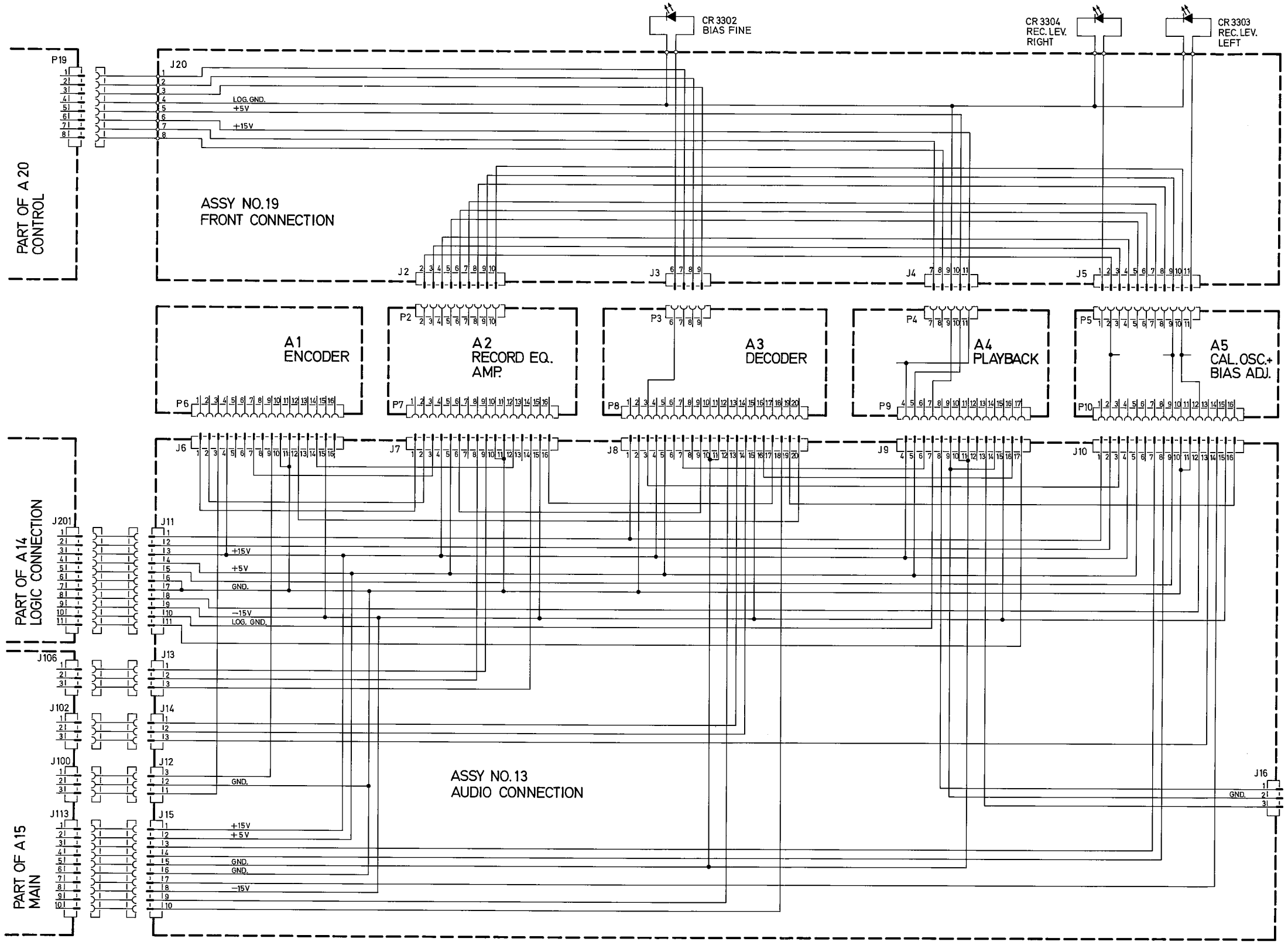


ASSY 12 – POWER

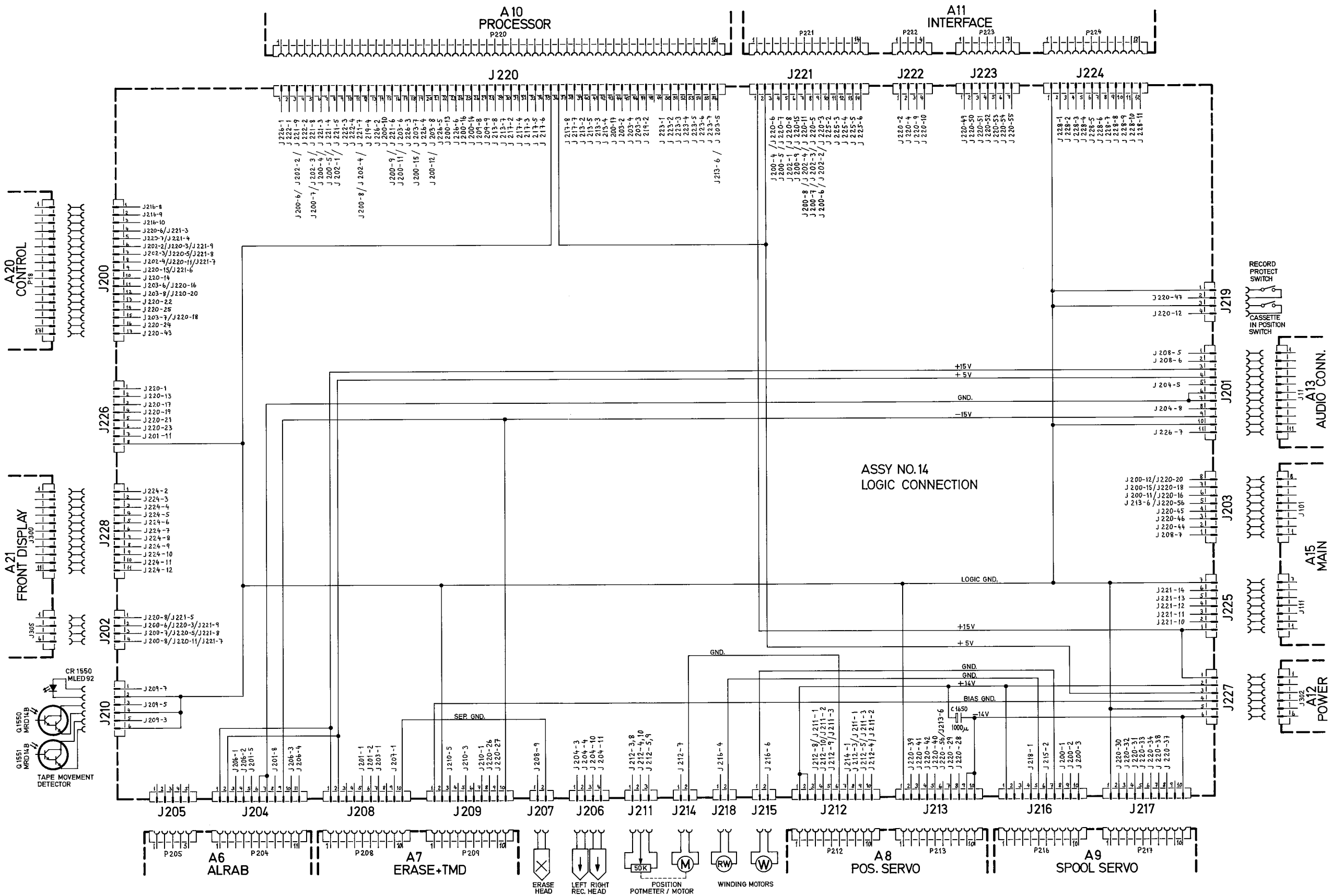
The power circuit supplies ±15 V for the audio circuits, + 5 V for the logic circuits, and ±14 V unregulated for the motor control circuits.



ASSEMBLY No. 12, POWER



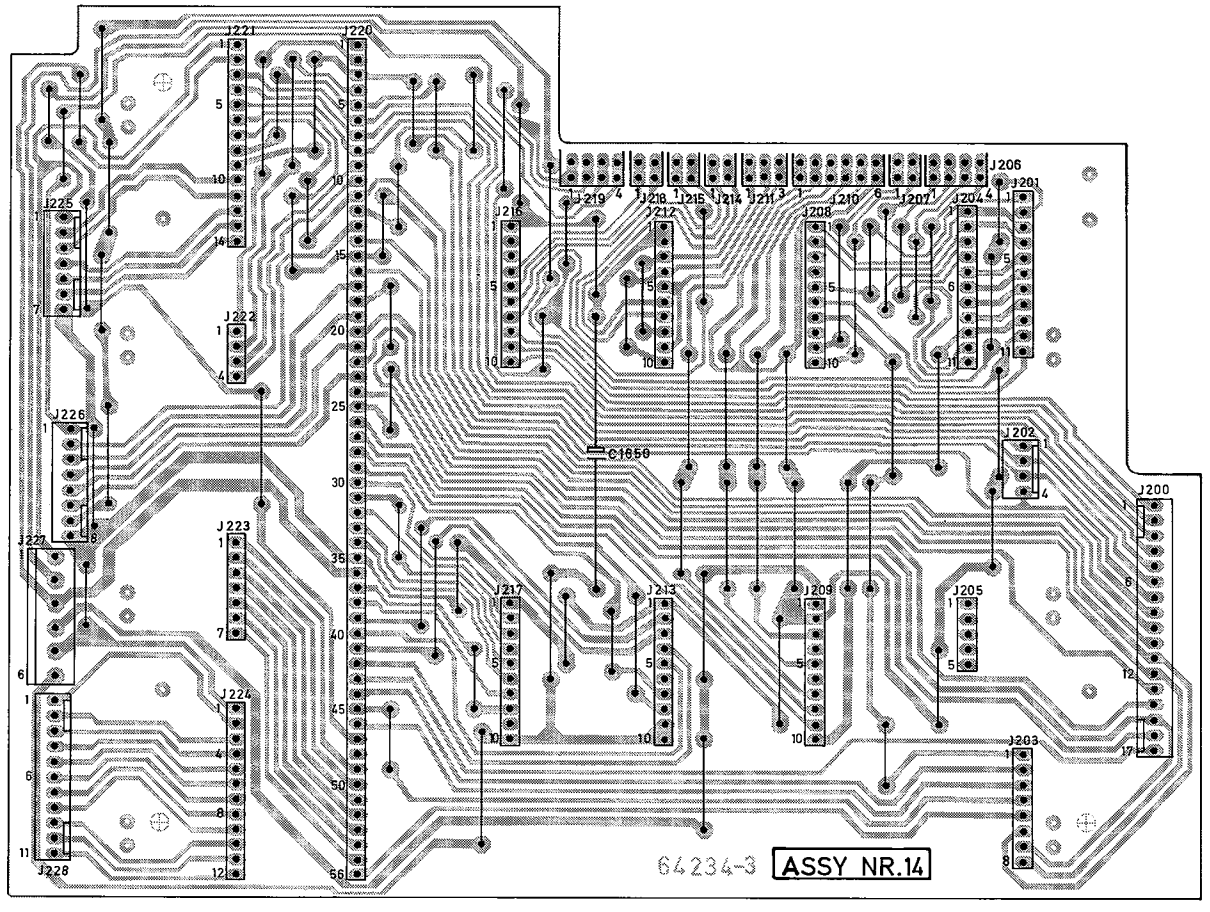
ASSEMBLY No. 13, AUDIO CONNECTION



The numbers on the contacts indicate the interconnections on the board.

Example: Pin 17 on contact J200 is internally connected to pin 43 on J220.

ASSEMBLY No. 14, LOGIC CONNECTION


J221
J220
J225
J222
J226
J227
J223
J224
J228
J216
J219
J218
J215
J214
J211
J212
J208
J210
J207
J204
J206
J201
C1650
J202
J200
J217
J213
J209
J205
J203
64234-3
ASSY NR.14

Q2101 is a line buffer and Q 2102 is the current generator. Q1203 to Q1207 form the microphone amplifier with self adjusting sensitivity (R10 is the feedback resistor). With the microphone disconnected, the R2125 gives low impedance feedback for minimum output noise. Q1208 to Q1211 form a summing amplifier and a second order 60 kHz low pass filter. The line input sensitivity is adjusted with R2024.

AC voltage is rectified and filtered giving the base drive for Q3104. Collector is low when the power is on. Q3101, Q3102, and Q3103 form a conventional circuit for delayed relay switching. Collector of Q3103 is connected to the meter circuit for meter damping during power on/off.

The logic circuits control the meter switch, LED's, source/tape switch and erase oscillator.

Record or playback signals are connected to the meter circuits via analog switches. The switches are controlled by the processor. The meter sensitivity is adjusted with the input volume controls.

Q2902, Q2903, and Q2904 are the cal. meter amplifier. Q2901 is a 30 dB attenuator.

U2550 is a meter amplifier. The signal is amplified and phase switched for symmetrical peak detection. R2514 and C2501 set the rise time on the program meter to 15 msec. and R2501, R2508, and C2501 set the fall time to 660 msec.

Q2701 to Q2707 are the output amplifier. R2701 and R2708 set the gain to approx. 2.15x.

ASSY 15 — MAIN

ASSY NO. 15 MAIN

1mV DENOTES DC VOLTAGES.

(1mV) DENOTES SIGNAL VOLTAGES (1000 Hz).

• DC VOLTAGES ON INPUT AMP. WITH GENERATOR CONNECTED.

ASSY NO. 16 ILLUMINATION

CASSETTE ILLUM.

PART OF A12 POWER

ASSY NO. 17 PHONO

PART OF A14 LOGIC CONNECTION

PART OF A21 FRONT DISPLAY

MIC. LEFT

MIC. RIGHT

INPUT AMP. LEFT CH.

INPUT AMP. RIGHT CH.

POWER ON/OFF

METER ADJ.

METER SWITCH

CAL. IND. AMP. LEFT CH.

LEVEL IND. AMP. LEFT CH.

CAL. IND. AMP. RIGHT CH.

LEVEL IND. AMP. RIGHT CH.

OUTPUT AMP. LEFT CH.

OUTPUT AMP. RIGHT CH.

REMOTE CONTROL

REED-RELAY

HEADPHONES

MASTER CONTROL BOARD

RIGHT LEVEL IND.

LEFT LEVEL IND.

CAL. IND.

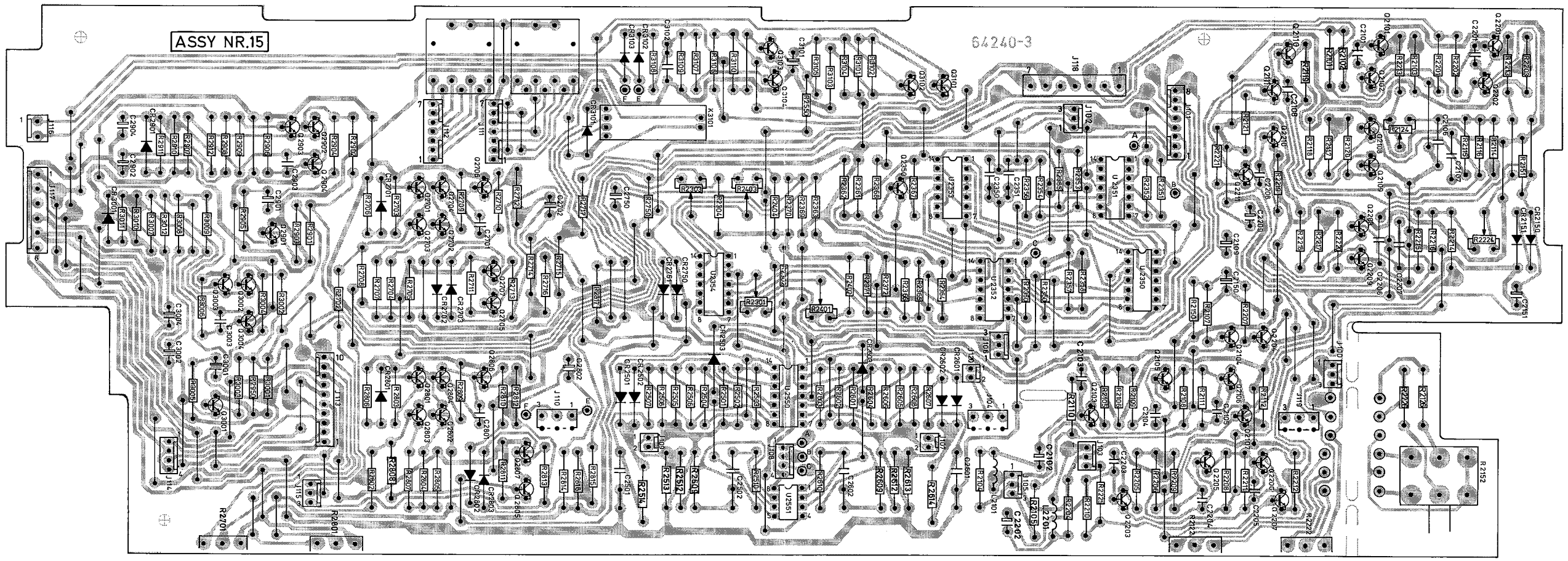
AZIMUTH LED.

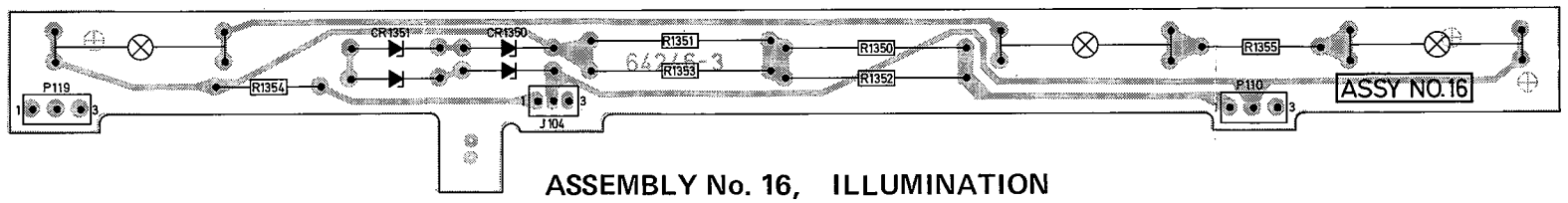
PART OF A14 LOGIC CONNECTION

PART OF A15 AUDIO CONNECTION

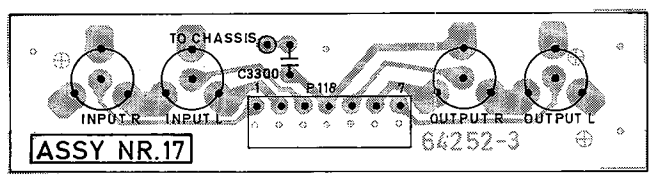
* CAL. SEL.: „ REC. LEVEL RIGHT

ASSEMBLY No. 15, MAIN

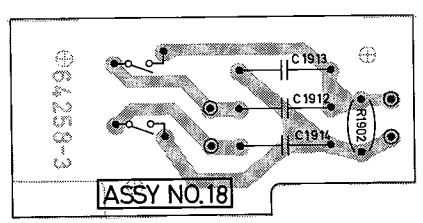

ASSY NR.15
64240-3



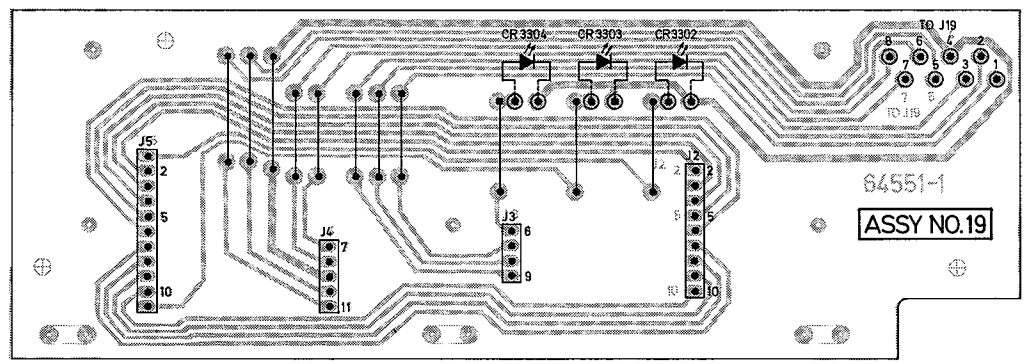
ASSEMBLY No. 16, ILLUMINATION



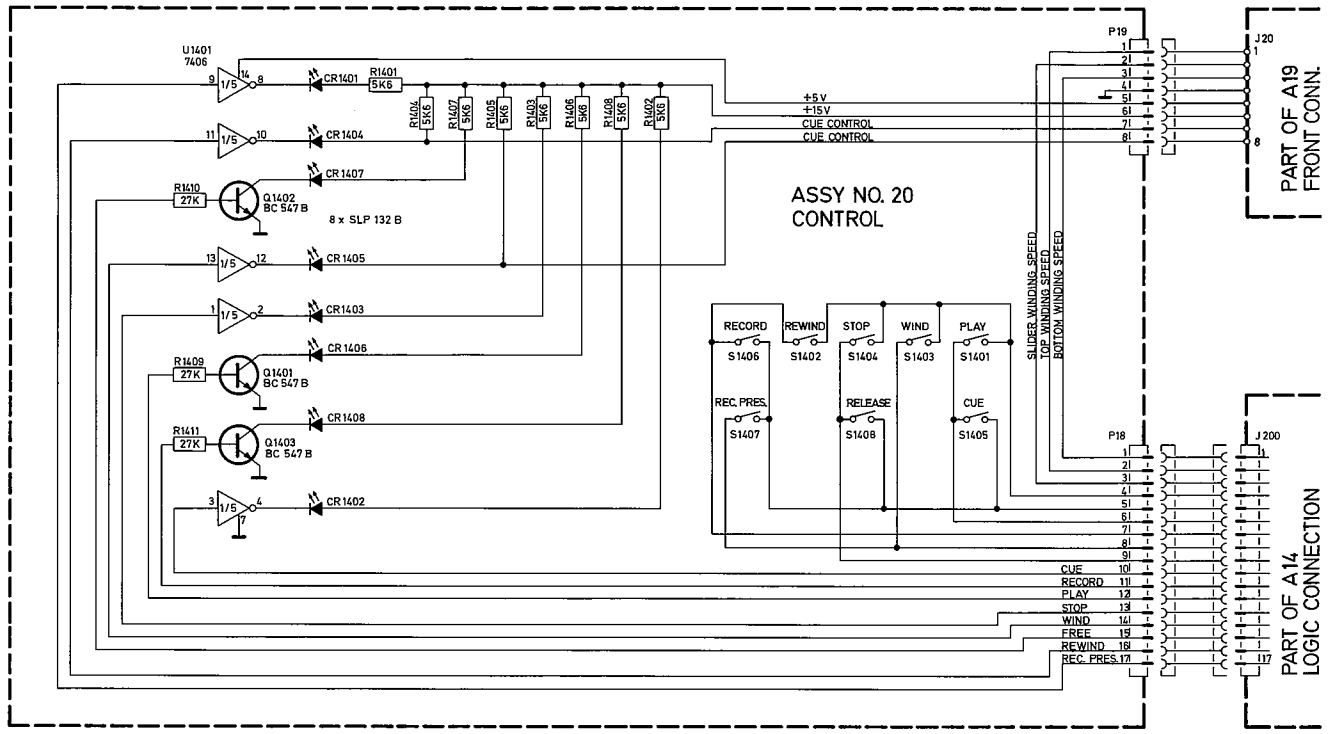
ASSEMBLY No. 17, PHONO

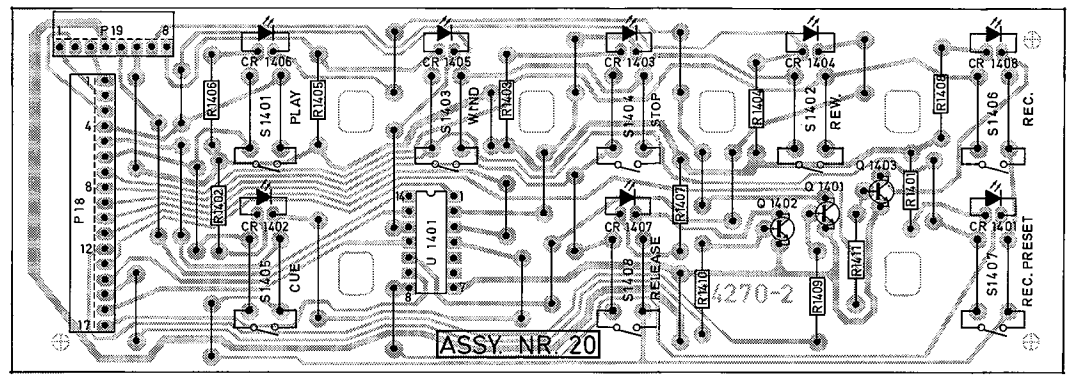


ASSEMBLY No. 18. POWER SWITCH

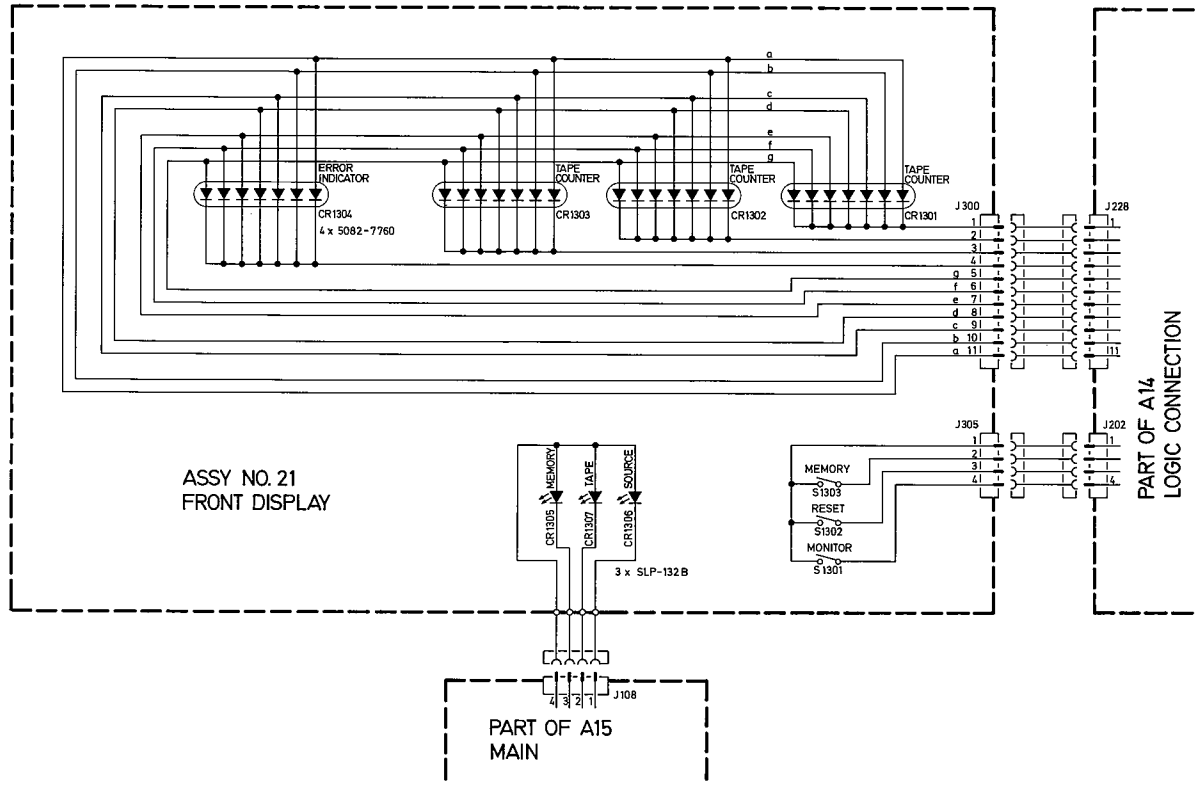


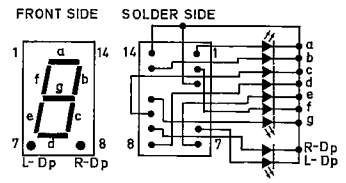
ASSEMBLY No. 19. FRONT CONNECTION

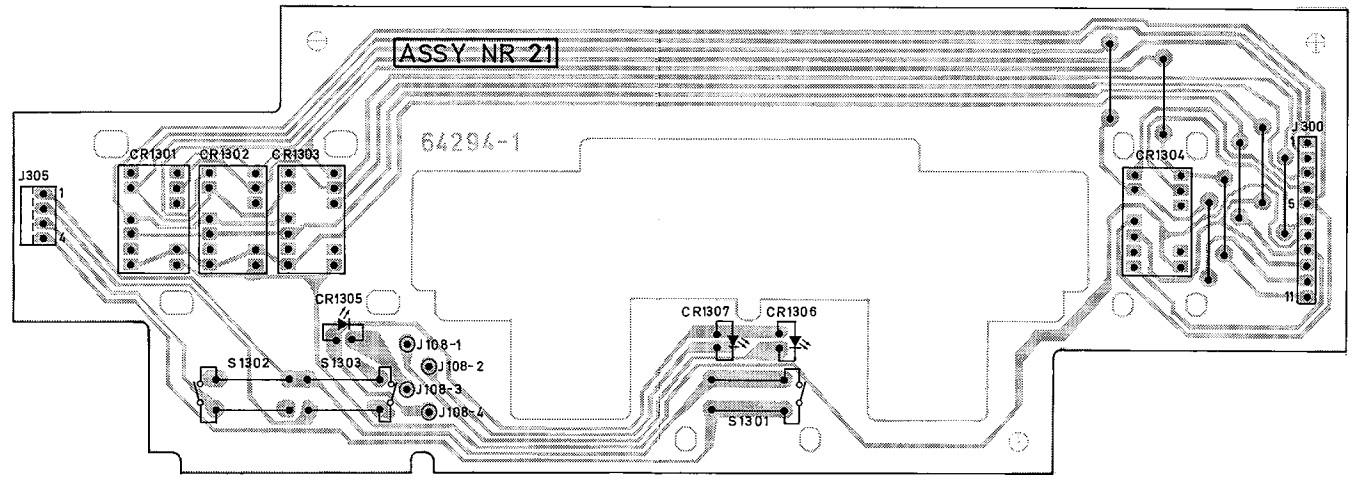




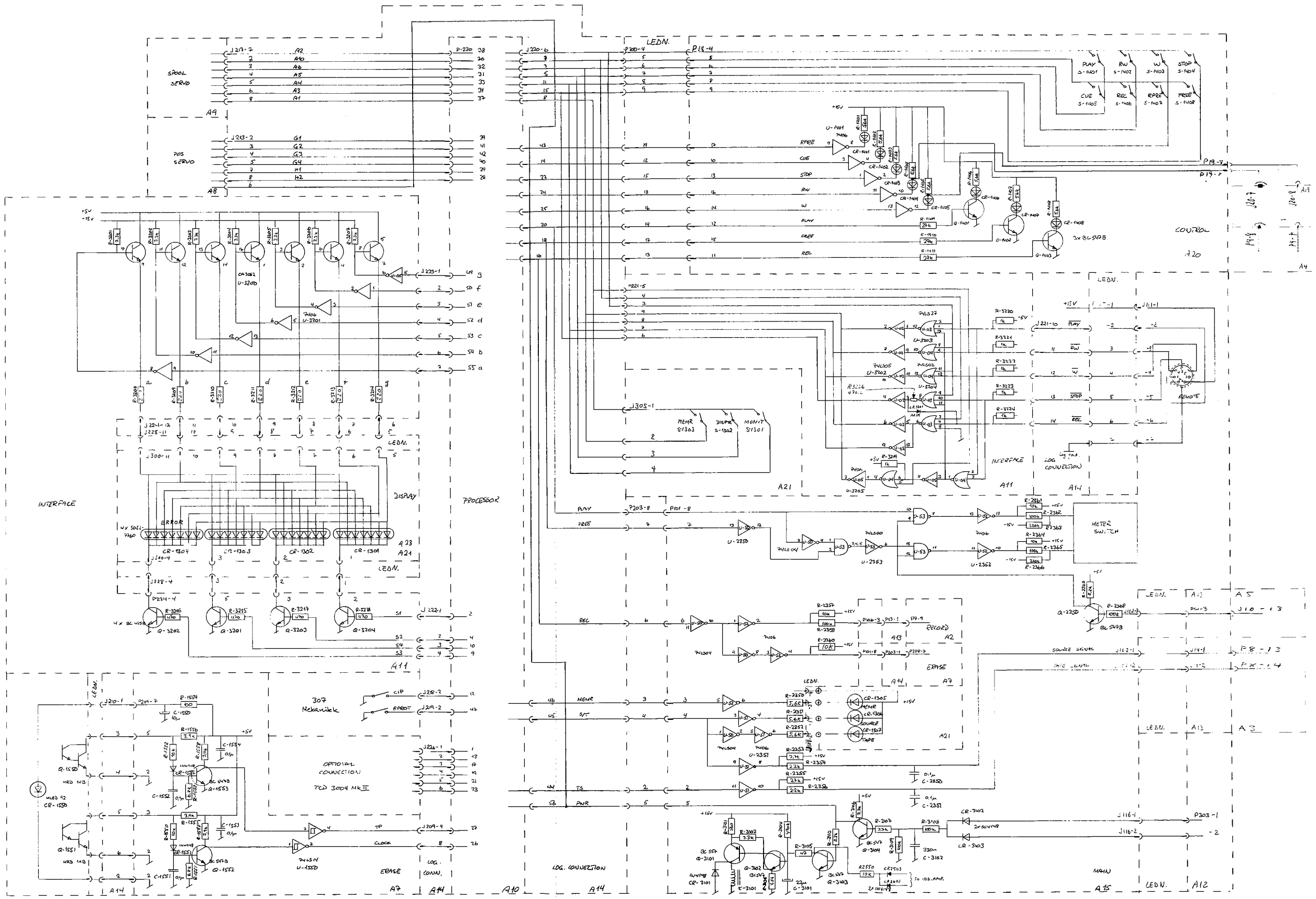
ASSEMBLY No. 20, CONTROL



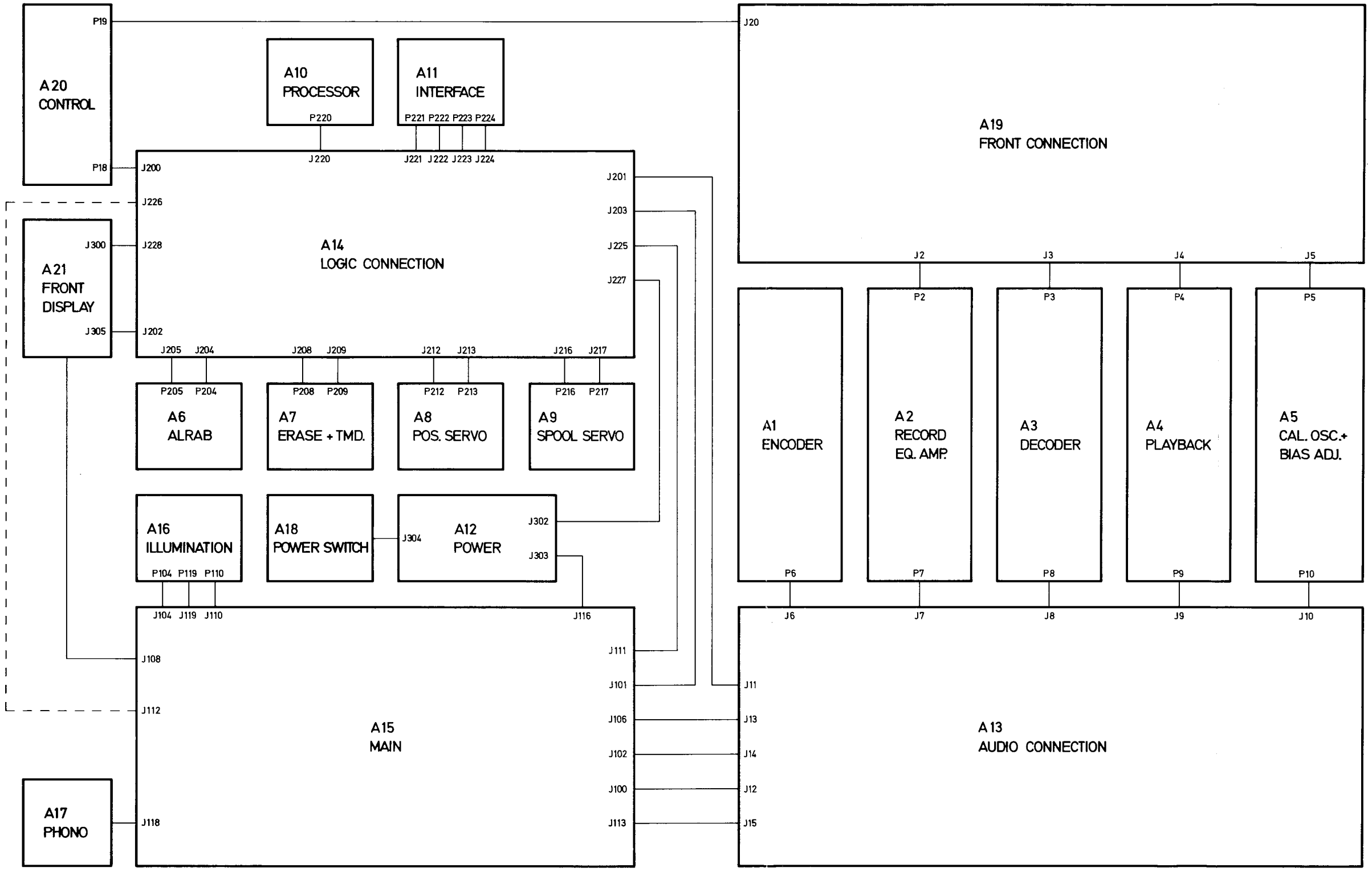




ASSEMBLY No. 21, FRONT DISPLAY



LOGIC CONNECTION



WIRING DIAGRAM